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Dr Om Asplenic Patient Case Report

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Dr Om Asplenic Patient Case Report

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(Dr. Om Baghele. Perio. Pre-final draft)

DENTAL SURGERY IN AN ASPLENIC PATIENT – A CASE REPORT

ABSTRACT

388 | Nonsurgical¹ endodontic treatment is a highly predictable treatment option in most cases but² surgery³ may be indicated⁴ for teeth with persistent periradicular⁵ pathosis unresponsive to it⁶. The persistence of infection usually, but not always, indicates⁷ reduced immunological resistance. In such scenario^{8,9} the clinician should be vigilant and find out the source before implementing treatment. Following splenectomy¹⁰, individuals have an elevated risk of infection¹¹, in particular to encapsulated bacteria¹², Gram-negative pathogens¹³ such as Capnocytophaga¹⁴ carnimorsus¹⁵ and Bordetella holmesii¹⁶, and intra-erythrocyte parasites¹⁷ such as Malaria¹⁸ and Babesia¹⁹. After splenectomy²⁰, there are alterations in cell counts, cell quality, and immunological responses. Initially after splenectomy²¹, a reactive thrombocytosis and leukocytosis²² observed. Splenectomised²³ individuals are at risk to²⁴, overwhelming bacterial sepsis (OPSI). The complications²⁵ are now infrequent because of pneumococcal vaccinations, prophylactic penicillin, and prompt medical attention at the first sign of fever. This case presents a management of a periradicular lesion in 32²⁶ year old male who has undergone splenectomy²⁷ because of idiopathic thrombocytopenic purpura (ITP)²⁸. The tooth was first endodontically treated that²⁹ was followed by periodontal surgical treatment^{30,31}.

Keywords: persistent periapical infection, endodontic treatment, dental management, periodontal surgery, splenectomy, idiopathic thrombocytic purpura, periapical surgery, asplenic patient.

INTRODUCTION

A majority of periapical lesions develop as sequelae to pulpal disease. An array of microorganisms from the pulp tissue may lead to tractable or intractable dento-salveolar infections. They are generally diagnosed either during radiographic examination or following acute dental pain or when they become symptomatic. Most periapical lesions can be classified as radicular cyst, abscesses or periapical granulomas. For such lesions root canal therapy (RCT) is one of the most successful and established treatment. But still 9.7.% of these treatments can fail because of various reasons.¹

³⁸⁹ After the failure of the conventional root canal treatment, nonsurgical retreatment is the preferred option in most cases. Several factors, such as complex root canal system or previous procedural accidents or traumatic injuries may impede the success of non surgical retreatment. In these cases, periapical surgeries would be the treatment of choice to preserve the tooth. These periapicalsurgery belongs to the field of endodontic surgery, which also includes incision and drainage, closure of perforations, and root or tooth resections.² This periapical surgery can be performed by endodontist, periodontist and oral maxillofacial surgeon, or even a General Dental Practitioner (GDP), with appropriate skill sets and expertise. Periapical surgery or an apicoectomy was well defined in 1884 by J. Farrar as "a bold act, which removes the entire cause [of disease] and which will lead to a permanent cure may not be the best in the end, but the most human."³ The objective of apical surgery is to surgically maintain a tooth that primarily has an endodontic lesion

391 that cannot be resolved by conventional endodontic treatment or
 (re-)treatment.^{2,4} Performing root end resection and preparation,⁵⁹ the root canal⁶⁰
 filling is placed within the created cavity to close the path of communication
 between infected root canal system and peri-radicular tissues.

Indications for apical surgery³ have been recently updated by the ESE (European
 Society of Endodontology, 2006)⁵ and include the following:

- 392 (1) Radiological findings of apical periodontitis and/or⁶¹ symptoms associated
 with an obstructed canal (the obstruction proved not to be removable,
 displacement did not seem feasible or⁶² the risk of damage was too great).⁶³
 (2) Extruded material with clinical or radiological findings of apical periodontitis
and/or⁶⁴ symptoms continuing over a prolonged period.
 (3) Persisting or emerging disease following root-canal treatment when root
 393 canal re-treatment⁴⁸ is inappropriate.
 (4) Perforation of the root or the floor of the pulp chamber and where it is
impossible to treat from within the pulp cavity.⁶⁵

394 Contraindications for apical surgery³ include the following: the tooth has no
function (no antagonist, no strategic importance serving as a pillar for a fixed
 395 prothesis),⁶⁶ the tooth cannot be restored,⁶⁷ the tooth has inadequate periodontal
support, or the tooth has a vertical root fracture.⁶⁸ Additional general contra-
indications^{69,70} may be an uncooperative patient or a patient with a compromised
 medical history for an oral surgical intervention⁶

In endodontically treated horizontal root fractures⁷¹ in which there are symptoms⁷²
 of apical fragments involved, the most indicated treatment is surgical removal⁷³
 of the coronary fragment⁷ Another indication for apical surgery³ is when wide⁷⁴
 radiopaque periapical lesions of over 8-10 millimetres⁷⁵ in diameter exist.
 These lesions may thereby be removed,⁷⁶ and histological examination may be
performed⁷⁷ to prevent malignant lesions from going undiagnosed⁸

396 | Patients who have undergone splenectomy ¹¹ are known to have ⁷⁸ an increased risk of overwhelming infection with an overall mortality rate of 2.5 percent.^{9,10} Dental practitioners are urged ⁷⁹ to consult with the patient's physician regarding the patient's overall ⁸⁰ medical status. ⁸¹ Risk ⁸² of infection and sepsis is only one concern in the asplenic patient. The dental practitioner also must examine the reason for asplenia and correlate dental therapy with the medical condition of the patient. ⁸³

The spleen is a fist-sized spongy organ situated in the upper left abdomen, behind the lower ribs, that comprises approximately 25percent of the body's lymphoid tissue.^(fig.1) It ⁸⁴ consists of a ⁸⁵ white ⁸⁶ pulp, a red pulp ⁸⁷ and a surrounding fibrous capsule. The white pulp ⁸⁸ derives its appearance from ⁸⁹ the presence of white blood cells, particularly lymphocytes, that accumulate in the periarterial lymphatic sheaths and follicles.The red pulp derives its appearance from the gathering of erythrocytes in the splenic sinus capsule.^{11(fig.2)} ⁹⁰ ⁹¹ ⁹² ⁹³

398 | The spleen plays an important ⁹⁴ role in the body's ⁹⁵ defence mechanism against microbial infections. However, trauma or diseases sometimes make removal ⁹⁶ of this important ⁹⁷ organ necessary,⁹⁸ which predisposes patients to certain infections. This increased risk of infection and the underlying reason for the organ's removal both may affect the provision of dental care.¹¹ ⁹⁹ Since the first deliberate removal of a diseased spleen by Quittenbaum¹² in 1826 ¹⁰⁰ splenectomy has become a well established surgical procedure.

399 | Spleen function: Immunological function

The spleen can initiate immune responses to blood-borne antigens, produce antibodies, and clear antibody-mediated pathogens. The spleen ¹⁰¹ consists of cells involved in both innate and adaptive immunity.Red ¹⁰² pulp macrophages filter the blood and remove bacteria, damaged erythrocytes, and erythrocyte inclusions. Marginal zone macrophages remove cellular debris in the marginal

401 |

402 zone and tingible body macrophages((tingible body macrophage is a type of
 403 macrophage predominantly found in germinal ¹⁰³centres, containing many
 phagocytized, apoptotic cells in various states of degradation, referred to as
 tingible/ stainable bodies. They contain condensed chromatin fragments)
 404 remove B-cell debris in the germinal center of the follicle. In addition to
 macrophages, there are also dendritic cells, natural killer cells, and monocytes
 that are ¹⁰⁴involved in inducing T cell responses to pathogens.¹⁰⁵The white pulp of
 the spleen is B-cell dominant (follicles) with some T cell zones. Splenic B cells
 produced specific antibodies for immunity (affinity maturation) and to enhance
 cytotoxic T-cell activity.¹³

Hematological function

405 The spleen also sequesters blood cells ¹⁰⁶including platelets. The ¹⁰⁷spleen is
 thought ¹⁰⁸to pool approximately one-third of the total platelet volume in addition
¹⁰⁹to sequestration ¹¹⁰of erythrocytes and granulocytes. Tests of splenic function
evaluate the capacity of the spleen to remove intra-erythrocytic inclusions
such as Howell–Jolly bodies and erythrocyte pits, in addition to its ability to
maintain IgM memory B cell population.¹¹¹¹⁴

A spleenless existence ¹¹²was considered to be ¹¹³quite safe as the spleen was
 considered ¹¹⁴unnecessary for life until 1952 when King and Schumacher drew
 attention to the risk of overwhelming ¹¹⁵post splenectomy infection (OPSI).¹⁵As
 the ¹¹⁶spleen is responsible for making antibodies and removing bacteria, ¹¹⁷aged,
 antibody-coated and damaged blood cells, those without a spleen have an
 impaired immune system.^{16,17}Because of this, ¹¹⁸splenectomized patients have
 a more difficult time ¹¹⁹recovering from pneumonia, meningitis, ¹²⁰haemophilus
¹²¹influenzae (Hib) flu, sepsis, nosocomial infections, babesiosis (a tick-borne
 disease), malaria and other parasitic diseases and gram-negative bacterial
 diseases from animal bites.^{18,19,20}Although the liver can perform this

function in the absence of the spleen, higher levels of specific antibody ¹²² and an intact complement system are probably required.¹⁷ The changes in immune function that occur after splenectomy result in ¹²³ increased risk of infection and predispose patients to high-grade bacteraemias and overwhelming sepsis.

Absolute indications for splenectomy²¹

Splenic trauma Splenic rupture-Spontaneous (tropical splenomegaly),

Delayed rupture (subcapsular ¹²⁴ haematoma from trauma),

¹²⁵ Splenic abscess (e.g. ¹²⁶ tuberculous infection)

Splenic cysts,

Neoplasm, ¹²⁷ As part of radical surgical oncological clearance of adjacent ¹²⁸ tumour.

e.g. ¹²⁹ locally advanced gastric carcinoma, pancreatic carcinoma, Angioma,

Primary (rare), ¹³⁰ Aneurysm of ¹³¹ splenic artery

Complications of splenectomy-21

¹³² Haemorrhage,

Thromboembolic,

Subphrenic abscess,

Chest infection,

Acute

Short term

Long term

¹³³ Haemorrhage

During

Immediately

Overwhelming postoperative infection

Disseminated intravascular coagulation

OPSI/DIC

Pulmonary atelectasis and pneumonia

Pulmonary infection

Pulmonary infection

Sympathetic pleural effusion

Subphrenic abscess/cellulitis

Deep vein thrombosis

Venous thrombosis

Gastric ileus

Spleno¹³⁴-portal thrombosis(fever, abdominal complaints)

Pulmonary hypertension

Acute pancreatitis

Enhanced arteriosclerosis¹³⁵

Thrombocytosis and leucocytosis(peaks 7th-14th day)

Arterial thrombosis

Severe thrombosis

After splenectomy¹¹

Myeloproliferative disorders

Table no.1 complications of splenectomy¹¹

Prevention of overwhelming post splenectomy¹³⁶ infection (OPSI)22

Class

OPSI prophylaxis

Timing

<2 years

None (immature immune system)

>2 years

Immunization

At least 2 weeks before splenectomy¹¹ for optimal antibody response

Functional hyposplenism (e.g. sickle cell, ITP, coeliac disease)

Emergency splenectomy

Immunization

Following emergency splenectomy

Immunization effect not as good

Still better than not being given

Asplenic patients

Immunization

Add influenza vaccine (prophylaxis against secondary bacterial infection)¹³⁷

Splenectomy in underlying immunosuppressive disease (e.g. lymphoproliferative) or sickle cell disorder

Immunization

Life long prophylactic antibiotics

Monitor response to pneumococcal vaccination

Timing of revaccination determine by levels of protective antibody¹³⁸Splenectomy in patients on immune suppressing¹³⁹ therapies (chemotherapy and/or radiotherapy)¹⁴⁰

Immunization

Life long prophylactic antibiotics

Immunization delayed at least ¹⁴¹6 months following chemotherapy/radiotherapy ¹⁴

High risk ¹⁴³ patient (<18yrs, immunosuppressed)

Life long prophylactic antibiotics against pneumococcal infection(penicillins/macrolides)

Prompt systemic antibiotic treatment for infection

Regularly reviewed in light of local pneumococcal resistance patterns ¹⁴⁴

Low risk ¹⁴⁵ patients

Counselled ¹⁴⁶ on risks and benefits of life long ¹⁴⁷ antibiotics and choose to discontinue

Carry a supply of appropriate antibiotics for emergency

Antimalarial prophylaxis

Malaria belt

Treat malaria infection early and aggressively ¹⁴⁸

Table no 2. Summary of British haematology ¹⁴⁹ guidelines on timing and type of vaccinations in elective and emergency splenectomy.

The present case report describes a combination of endodontic therapy ¹⁵⁰ and periapical surgery ³ with use ¹⁵¹ of Biodentine in asplenic patient, ¹⁵³ to emphasize that a vigilant ¹⁵⁴ approach is required to deliver dental care appropriately and successfully for the patient.

CASE REPORT

A 32 year old ¹⁵⁵ male reported to the Department of Periodontics at Maharashtra institute of dental sciences, Latur ¹⁵⁶ with a chief complaint of pus discharge and ¹⁵⁷

pain in upper front region of jaw since last ¹⁵⁸ 2 weeks ^{159 160} .^{161,162} Medical history ¹⁶³ revealed that he was diagnosed with idiopathic thrombocytopenic purpura (ITP) ten years ago after that he underwent splenectomy ¹¹ Acomplete ¹⁶⁴ haemogram was ¹⁶⁵ carried out ¹⁶⁶ and all the parameters found within normal limits.

Complete haemogram

Sr.

No.

Name of the test

Observed values

(Normal values)

1

Red blood cells(RBC)

4.74X10⁶μL

5-5.5X10⁶ μL(male),

4.5X10⁶ μL(female)

2

White blood cells(WBC)

10.7X10³μL

4000-11000/μL

3

Haemoglobin (Hb) ¹⁶⁷

13.1gm%

13-15gm% for male

12- 14gm% female

4

Neutrophils

46%

40-75%

5

Basophils

00%

0-1%

6

Eosinophils

05%

0-6%

7

Lymphocytes

45%

20-40%

8

Monocytes

04%

0-8%

9

Platelet count

4,61,000/cumm

1.5-4.5lacs/cumm¹⁶⁸

10

Bleeding time(BT)

2 min 38 sec

2-6min

11

Clotting time (CT)

4 min 51sec

2-8 min

12

Prothrombin time (PT)

17 sec

11-13.5sec

13

CON

16 sec

15-30 sec

14

International normalized ration¹⁶⁹(INR)

1.1

1

15

Kidney function test Serum creatinine¹⁷⁰

1.12mg%

0.8-1.4mg%

16

Blood sugar ®

80mg/dl

70-140mg%

17

Liver function test

Total proteins

Albumin

Globulin

Total bilirubin

Direct bilirubin

SGOT

SGPT

ALK phosphatase

7.2gm%

4.2gm%

3.0gm%

0.51mg%

0.16mg%

28.5U/L

17.1U/L

10.3U/L

6.6-8.3gm/dl

3.5-5.0gm/dl

2.5-3.5gm/dl

0.20-1.00mg/dl

0.0-0.20mg/dl

UPTo 46U/L

UPTO 49U/L

60-170U/L

18

HbsAg Australia Antigen

Negative

19

HIV-I, HIV-II antibody

Negative

Table no.3 Complete Haemogram

There is no history of spontaneous bleeding and edema or any sign of ecchymosis in the recent past ¹⁷¹6 months.¹⁷² Dental history revealed trauma^{173,174} to the upper left front teeth and pus discharge from ¹⁷⁵labial aspect eighteen years ago.¹⁷⁶ Ellis class IV fracture. Endodontic treatment was suggested¹⁷⁷ which¹⁷⁸ consisted of apexification¹⁷⁹ for 21 due to incomplete root development seen on IOPA. Accordingly endodontic treatment was performed with 21,22. The patient was asymptomatic for 4 months¹⁸⁰,^{181,182} after endodontic treatment,¹⁸³ until he reported to department of Endodontics with complains of pus¹⁸⁵ discharge with 21.¹⁸⁶ The sinus tract opening in relation to the 21,22 after RCT. On performing sinus tracing, it revealed that sinus originated particularly with 21(on the labial site). Intra-oral gingival examination showed reddish pink color¹⁹¹ with melanin pigmentation, ¹⁹²Gingival margins were scalloped.

Probing depth

3

2

1

1

2

3

Palatal

3

2

3

3

2

3

3

2

3

3

2

3

3

2

3

3

3

3

Labial

3

3

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3

2

3

3

3

3

3

3

3

3

2

3

3

3

3

Mobility

1

|

Table no.4 Periodontal Examination w.r.t upper 13-23

Radiographic Examination:

Cone beam computer tomography (CBCT) of concern teeth reveal that well defined periapical abscess or infection.¹⁹³ (approx. dimensions 3X3mm)(fig.3)

Intraoral Periapical Radiograph (IOPA) showed well defined periapical radiolucency seen w.r.t 21,22. W.r.t 21 open apex seen.(fig.4)

Diagnosis:

The differential diagnosis included periapical abscess, granuloma¹⁹⁴ or radicular cyst secondary to necrosed¹⁹⁵ pulp because of accidental trauma.

The periodontal diagnosis according to 2017 Classification of Periodontal Diseases was put forth as "Generalized gingivitis- dental plaque induced on intact periodontium- mediated by systemic factor (splenectomised condition) with endo-periodontal lesion without root damage in a non-periodontitis patient- Grade 1."¹⁹⁹

Treatment Plan

Endodontic Management: Based on Diagnosis

The combined endodontic- periodontic lesions are best treated by first performing the necessary endodontic care followed by periodontal therapy,²⁰⁰ if required.²⁰¹ Still, the periodontal hygiene procedures are started first.²⁰³ Pulp vitality tests were performed.²⁰⁵ Thermal tests and electrical pulp tester elicited a negative response when compared to control teeth.²⁰⁶ The clinical and radiological evaluation confirmed the maxillary left lateral incisor associated with

periapical pathology. Under rubber dam isolation, necrotic pulp ²⁰⁷ was removed ²⁰⁸ from root canals. Cleaning and shaping was achieved ²⁰⁹ using stainless steel K ²¹⁰ Files (fig.5) (Mani, Japan) by crown down technique to minimize the apical extrusion.

Irrigant used was 5.25% sodium hypochlorite and 17% EDTA (ethylene ²¹¹ diaminetetraacetic acid) ²¹² and saline ²¹³ was used ²¹⁴ in between two irrigants.. ²¹⁵ The canals were finally flushed with chlorhexidine and then repeated ²¹⁶ water based ²¹⁷ Ca(OH)₂ paste (fig.6) was given ²¹⁸ for approximately ²¹⁹ period ²²⁰ of one year. ²²¹ The tooth was asymptomatic and ²²² the periapical radiolucency ²²³ showed sign ²²⁴ of reduction ²²⁵ with 21.

Apexification done ²²⁴ with 21 using Bio-dentine ²²⁵ apical plug followed by final obturation done using thermoplastisized ²²⁶ Gutta Percha. ²²⁷ Post ²²⁸ obturation restoration done ²²⁹ using composite resin. The patient was re-examined ²³⁰ after two months for review ²³¹ then there was a sinus tract opening w.r.t 21 after tracing it with gutta percha ²³² point (fig.8) it was confirmed ²³³ that sinus opening associated with 21 and periapical radiolucency remained unchanged. Patient ^{234,235} was planned ²³⁶ for surgical intervention.

Periapical Management

The surgical procedure was performed ²³⁷ using infraorbital and nasopalatine nerve blocks and field blocks as necessary, by infusing lignocaine with 1:80000 adrenaline as local anaesthetic ²³⁸ (fig.9)(fig.10). Trapezoidal flap design ²³⁹ was ²⁴⁰ planned. ²⁴¹ Buccal full thickness ²⁴² mucoperiosteal flaps ²⁴³ were raised ²⁴⁴ extending from the maxillary right central incisor tooth to the maxillary left first premolar tooth, with a buccal vertical relieving incision at the maxillary left premolar tooth and at ²⁴⁵ maxillary right central incisor (fig.11),(fig.12).

After full thickness ²⁴⁵ flap reflection buccally, degranulation done in periapical ²⁴⁶ region of 21,22, then flushed with the normal saline (0.9%), followed by ²⁴⁷ a small

osteotomy produced²⁴⁸ to locate the root-end that was resected by about 3 mm (fig.13) (fig.14) The resection plane was slant or perpendicular(for avoiding the apical microleakage) to the long axis of the tooth. After this root end filling^{249 250} material was placed into the cavity preparation with Biodentine (fig.15) Before suturing a radiographic verification made²⁵¹. Flap approximation and suturing was done(continuous sling sutures)²⁵³(fig.16).Post-operative radiograph taken(fig.17),after 8days follow up given (fig.18). patient reported²⁵⁴ for follow up after 1 month (fig.19) (fig.20).

407

Discussion

After the failure of the conventional root canal treatment (RCT), non-surgical¹ retreatment⁴⁸ is the preferred option in most cases. Several factors, such as a complex root canal system or previous procedural accidents, may impede the success of non-surgical retreatment^{1 48 255}. In these cases, periradicular surgery^{256 3} and apicoectomy would be the treatment of choice to preserve the tooth²⁴Periapical surgery^{3,257} is the last hope to save an endo-dontically²⁵⁸ treated tooth with a periapical lesion. The treatment outcome of apical surgery³ should be assessed²⁵⁹ clinically and radiographically.Only²⁶⁰ the combination of clinical and radiographic healing criteria is accepted today to determine the outcome of apical surgery²⁵ Clinical healing is based on the absence of signs and symptoms such as pain, sinus tract, swelling, apico-marginal²⁶¹ communication, and tenderness to palpation or percussion. Standard radiographic healing classes include complete healing, incomplete healing ("scar tissue formation"), uncertain healing (partial resolution of postsurgical radiolucency), and unsatisfactory healing (no change or an increase in postsurgical radiolucency). This classification is based²⁶² on landmark studies that have compared radiographic findings with histopathologic results of periapical tissues of teeth that had to be extracted²⁶³ after apical surgery.²⁶ Several studies

have also ²⁶⁴ compared the healing outcome of re-surgery and first-time surgery cases.²⁶⁵ For re-surgery cases, the healing ²⁶⁶ outcome was 7% to 27% lower than for first-time surgery cases. A recent 5-year longitudinal study found a ²⁶⁷ low success rate of 59% for re-surgeries ²⁶⁸ compared to a high success rate of 86% for first-time surgeries.²⁶⁹ Another ²⁶⁹ important issue to consider in the healing outcome of apical ³ surgery is the difficulties and challenges of combined endo-²⁷⁰perio lesions, ²⁷¹ in particular the absence of the buccal bone plate with a completely exposed ²⁷² buccal root surface.

408 | Only a few clinical studies have compared the healing outcomes in apical ³ surgery of teeth with intact and ²⁷³ with missing buccal bone. Wesson and Gale (2003) determined the 5-year success rates associated with molar apical ³ surgery in consideration of the width of the buccal "bone cuff" ²⁷⁴ prior to wound closure.²⁷⁵ Teeth with a ²⁷⁵ width of 3 mm or greater of cuff had a healing rate of 76%, whereas teeth with no buccal bone cuff had a significantly lower healing rate of 46% (p< 0.0001). Numerous materials have ²⁷⁶ been recommended for ²⁷⁶ root ²⁷⁷ end obturation, and many studies have attempted to identify an ideal material;

409 | however, ²⁷⁸ an ideal ²⁷⁹ material has not been found³⁰

Dental considerations in ²⁸⁰ asplenic patient

410 | Patients who have undergone ¹¹ splenectomy are known to have an increased risk of overwhelming infection, with an overall mortality rate of 2.5 percent¹⁰ In the early 1980s, Terezhalmly and Hall supported the use of antimicrobial prophylaxis before performing dental procedures in these patients.³¹ Chaikof and McCabe reported that fatal sepsis ²⁸¹ can occur up to 30 years after ¹¹ splenectomy, Ellison and Fabri found that 20 percent of fatal sepsis cases ²⁸² occurred in the first six months and 60 percent occurred within two years.³² It ²⁸³ is known that dental procedures that induce mucosal bleeding may cause transient bacteremias, ²⁸⁴ but generally these occurrences do not overwhelm an

intact immune system. Streptococcus pneumonia, H. influenzae²⁸⁵, E. coli, N. meningitides²⁸⁶ and Pseudomonas aeruginosa²⁸⁷ are not endogenous to the oral cavity and have not been shown²⁸⁸ to cause bacteremias from dental procedures³³

Some clinicians feel that prophylactic measures with antimicrobial medications are less effective than prompt recognition and treatment of infection with aggressive antibiotic therapy when asplenic patients become febrile.³⁴ There is evidence of prophylactic antimicrobial therapy failing to prevent infection in asplenic patients²⁸⁹, and numerous animal studies have cast doubt on its efficacy^{35,36} Because compliance with long term, routine antibiotic prophylaxis is unreliable and its efficacy remains unproven in prospective randomized trials, it is prudent to avoid indiscriminatory use of antibiotic prophylaxis before dental procedures.²⁹¹ Patient was on medication (i.e. Tab. Pentid 400 mg once a day, contained penicillin G potassium)²⁹² for last 14 years which was prescribed by his physician, there were no history of any complication after taking this antibiotic dose, no history of any surgical procedure patient underwent during this prophylaxis, also no history of any infection (e.g. Overwhelming Post Splenectomy Infection).²⁹³ Before performing periodontal surgery²⁹⁴ the patient was asked to take a dose of his routine antibiotics, after the surgical procedure he was suggested for taking analgesics if needed.²⁹⁶

When treating other immunocompromised patients, dentists can take certain measures during the perioperative period to minimize the chance of infection.³⁰⁰ Patient education and scrupulous oral hygiene, use of antimicrobial mouthrinses before and after dental procedures, aggressive elimination of potential intraoral sources of infection³⁰¹ and frequent oral health maintenance all serve to minimize infectious complications in these patients³⁰² Dental practitioners are

³¹⁴ urged to consult with the patient's physician regarding the patient's overall medical status. ³¹⁵ Risk of infection and sepsis is only one concern in the asplenic patient. The dental practitioner also must examine the reason for asplenia and correlate dental therapy with the medical condition of the patient. ³¹⁶

⁴¹¹ Thrombocytopenia, a condition in which there is a reduced number of platelets in the peripheral blood, is associated with ³¹⁷ a number of diseases and conditions, including leukemia, lymphoma, certain anemias, systemic lupus erythematosus, HIV infection and ³¹⁸ hypersplenism. This condition also can be autoimmune-related, drug-related ³¹⁹ or idiopathic. It is believed that in ³²⁰ ³²¹ some of these diseases and conditions, platelets are attacked by antibodies and subsequently destroyed in the spleen. Initial therapy to increase the number of platelets focuses on ³²² reduction of antibody production by high dose, long-term corticosteroid therapy. ³²³ When this treatment modality fails, splenectomy ¹¹ is usually indicated³⁸Therefore, asplenic ³²⁴ patients may often suffer from underlying conditions that may alter routine dental procedures. Patients with ITP who have undergone splenectomy ¹¹ also have been shown to be ³²⁵ at increased risk of developing chronic active hepatitis.³⁹The body's immunological armor is damaged with ³²⁶ removal ³²⁷ of the spleen, providing a gateway for infections with ⁴¹² poorly opsonized bacteria. Sepsis in the splenectomised ³²⁸ individual is often severe and associated with high morbidity and mortality. Ongoing prevention with vaccination, antibiotic prophylaxis, and patient education is imperative in reducing the risk of infection. ³²⁹ Treatment ³³⁰ of the patient with chronic and chronic-acute viral hepatitis involves evaluation of ³³¹ liver function to rule out bleeding tendencies and altered drug metabolism.

CONCLUSION

With advancing medical and technological prowess, many people are living ³³² their lives without an important ³³³ organ or a group of organs. Similarly ³³⁴ many

people have transplanted or added organs ³³⁵ and the number of such survivors will increase in the future. Such patients will ³³⁶ definitely require dental treatment also. A dentist should ³³⁷ not only be knowledgeable about these ³³⁸ eventualities but also be able to manage them as and when necessary.

⁴¹³ The burden is on the general dentist to understand the immunological condition of patients who are asplenic or have splenic dysfunction and ³³⁹ to recognize associated underlying conditions that may require modification of dental care. The identification and prompt management in the high probability of infection provide the ³⁴⁰ splenectomised individual the best chance of early recovery.

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1.	<i>Nonsurgical; nonsurgical; non-surgical</i>	Text Inconsistencies	Correctness
2.	, but	Punctuation in Compound/Complex Sentences	Correctness
3.	<i>surgery; Surgery</i>	Text Inconsistencies	Correctness
4.	<i>be indicated</i>	Passive Voice Misuse	Clarity
5.	<i>periradicular</i>	Unknown Words	Correctness
6.	to it	Wordy Sentences	Clarity
7.	indicates → shows	Word Choice	Engagement
8.	a scenario	Determiner Use (a/an/the/this, etc.)	Correctness
9.	scenario,	Comma Misuse within Clauses	Correctness
10.	. Following	Improper Formatting	Correctness
11.	<i>splenectomy; Splenectomy</i>	Text Inconsistencies	Correctness
12.	earnimorsus → carnivorous	Misspelled Words	Correctness
13.	, and	Comma Misuse within Clauses	Correctness
14.	<i>holmesii</i>	Unknown Words	Correctness
15.		Intricate Text	Clarity
16.	. After	Improper Formatting	Correctness
17.	Initially,	Comma Misuse within Clauses	Correctness
18.	leukocytosisis → leukocytosis, leukocytosis is	Misspelled Words	Correctness
19.	Splenectomised →	Mixed Dialects of English	Correctness

Splenectomized

20.	to → of	Wrong or Missing Prepositions	Correctness
21.	, to,	Punctuation in Compound/Complex Sentences	Correctness
22.	. The	Improper Formatting	Correctness
23.	. This	Improper Formatting	Correctness
24.	a management → the management	Determiner Use (a/an/the/this, etc.)	Correctness
25.	<i>periradicular</i>	Unknown Words	Correctness
26.	32-year old → 32-year-old	Misspelled Words	Correctness
27.	who has → who has	Misspelled Words	Correctness
28.		Intricate Text	Clarity
29.	. The	Improper Formatting	Correctness
30.	the first	Determiner Use (a/an/the/this, etc.)	Correctness
31.	<i>endodontically</i>	Unknown Words	Correctness
32.	, that	Punctuation in Compound/Complex Sentences	Correctness
33.	that was → which was	Pronoun Use	Correctness
34.	<i>was followed</i>	Passive Voice Misuse	Clarity
35.	periodontal surgicaltreatment	Improper Formatting	Correctness
36.	surgical treatment	Misspelled Words	Correctness
37.	dento → to	Misspelled Words	Correctness

38.	salveolar → alveolar	Misspelled Words	Correctness
39.	a radiographic, or the radiographic	Determiner Use (a/an/the/this, etc.)	Correctness
40.	be classified	Passive Voice Misuse	Clarity
41.	a radicular	Determiner Use (a/an/the/this, etc.)	Correctness
42.	, or	Comma Misuse within Clauses	Correctness
43.	. For	Improper Formatting	Correctness
44.	lesions,	Comma Misuse within Clauses	Correctness
45.	treatment → treatments	Incorrect Noun Number	Correctness
46.	still,	Comma Misuse within Clauses	Correctness
47.	nonsurgical → non-surgical	Confused Words	Correctness
48.	retreatment; re-treatment	Text Inconsistencies	Correctness
49.		Intricate Text	Clarity
50.	the complex	Determiner Use (a/an/the/this, etc.)	Correctness
51.	injuries,	Punctuation in Compound/Complex Sentences	Correctness
52.	non-surgical → nonsurgical, non-surgical	Misspelled Words	Correctness
53.	would be → would be	Improper Formatting	Correctness
54.	periapical surgery	Misspelled Words	Correctness
55.	an endodontist	Determiner Use (a/an/the/this, etc.)	Correctness

56.	, and	Comma Misuse within Clauses	Correctness
57.	, or	Improper Formatting	Correctness
58.	Practitioner → Practitioner	Misspelled Words	Correctness
59.	root end → root-end	Misspelled Words	Correctness
60.	, the → ; the, , and the, . The	Punctuation in Compound/Complex Sentences	Correctness
61.	and/or → and, or	Inappropriate Colloquialisms	Delivery
62.	, or	Punctuation in Compound/Complex Sentences	Correctness
63.	great → high, significant, considerable	Word Choice	Engagement
64.	and/or → and, or	Inappropriate Colloquialisms	Delivery
65.		Intricate Text	Clarity
66.	prothesis → prosthesis	Confused Words	Correctness
67.	be restored	Passive Voice Misuse	Clarity
68.		Intricate Text	Clarity
69.	contraindications	Confused Words	Correctness
70.	contra-indications	Wordy Sentences	Clarity
71.	In → An	Confused Words	Correctness
72.	endodontically	Unknown Words	Correctness
73.	the surgical	Determiner Use (a/an/the/this, etc.)	Correctness
74.	wide → extensive, full	Word Choice	Engagement

75.	millimetres → millimeters	Mixed Dialects of English	Correctness
76.	<i>be removed</i>	Passive Voice Misuse	Clarity
77.	<i>be performed</i>	Passive Voice Misuse	Clarity
78.	are known to	Wordy Sentences	Clarity
79.	<i>are urged</i>	Passive Voice Misuse	Clarity
80.	the patient's → their	Wordy Sentences	Clarity
81.	overall → global	Word Choice	Engagement
82.	The risk	Determiner Use (a/an/the/this, etc.)	Correctness
83.		Intricate Text	Clarity
84.	.(	Improper Formatting	Correctness
85.	. It	Punctuation in Compound/Complex Sentences	Correctness
86.	a white	Determiner Use (a/an/the/this, etc.)	Correctness
87.	, and	Comma Misuse within Clauses	Correctness
88.	pulp → flesh	Word Choice	Engagement
89.	the presence of	Wordy Sentences	Clarity
90.	. The	Improper Formatting	Correctness
91.	pulp → flesh	Word Choice	Engagement
92.	appearance → emergence	Word Choice	Engagement
93.		Intricate Text	Clarity

94.	an important → a vital, an essential	Word Choice	Engagement
95.	defence → defense	Mixed Dialects of English	Correctness
96.	the removal	Determiner Use (a/an/the/this, etc.)	Correctness
97.	important → vital, critical	Word Choice	Engagement
98.	, which	Improper Formatting	Correctness
99.		Intricate Text	Clarity
100.	1826,	Punctuation in Compound/Complex Sentences	Correctness
101.	spleen → venom, anger	Word Choice	Engagement
102.	. Red	Improper Formatting	Correctness
103.	centres → centers	Mixed Dialects of English	Correctness
104.	that are	Wordy Sentences	Clarity
105.	. The	Improper Formatting	Correctness
106.	, including	Punctuation in Compound/Complex Sentences	Correctness
107.	spleen → anger, venom	Word Choice	Engagement
108.	is thought	Passive Voice Misuse	Clarity
109.	in addition to → and	Wordy Sentences	Clarity
110.	the sequestration	Determiner Use (a/an/the/this, etc.)	Correctness
111.		Intricate Text	Clarity
112.	was considered	Passive Voice Misuse	Clarity

113.	to be	Wordy Sentences	Clarity
114.	deemed to be unnecessary for, deemed unnecessary to	Word Choice	Engagement
115.	post-splenectomy	Misspelled Words	Correctness
116.	spleen → anger	Word Choice	Engagement
117.	aged,	Comma Misuse within Clauses	Correctness
118.	; splenectomized, , and splenectomized, . Splenectomized	Punctuation in Compound/Complex Sentences	Correctness
119.	recoveringfrom → recovering from	Misspelled Words	Correctness
120.	haemophilus → Haemophilus	Misspelled Words	Correctness
121.	influenzae	Unknown Words	Correctness
122.	, and	Comma Misuse within Clauses	Correctness
123.	an increased	Determiner Use (a/an/the/this, etc.)	Correctness
124.	haematoma → hematoma	Mixed Dialects of English	Correctness
125.	A splenic	Determiner Use (a/an/the/this, etc.)	Correctness
126.	e.g.,	Comma Misuse within Clauses	Correctness
127.	, As	Improper Formatting	Correctness
128.	tumour → tumor	Mixed Dialects of English	Correctness
129.	e.g.,	Comma Misuse within Clauses	Correctness
130.	, Aneurysm	Improper Formatting	Correctness

131.	the splenic, or a splenic	Determiner Use (a/an/the/this, etc.)	Correctness
132.	Haemorrhage → Hemorrhage	Mixed Dialects of English	Correctness
133.	Haemorrhage → Hemorrhage	Mixed Dialects of English	Correctness
134.	Spleno → Splenic	Misspelled Words	Correctness
135.	atherosclerosis	Misspelled Words	Correctness
136.	post-splenectomy	Misspelled Words	Correctness
137.	infection.	Closing Punctuation	Correctness
138.	antibody.	Closing Punctuation	Correctness
139.	immune-suppressing	Misspelled Words	Correctness
140.	and/or → and, or	Inappropriate Colloquialisms	Delivery
141.	6 → six	Improper Formatting	Correctness
142.	radiotherapy.	Closing Punctuation	Correctness
143.	High risk → High-risk	Misspelled Words	Correctness
144.	patterns.	Closing Punctuation	Correctness
145.	Low risk → Low-risk	Misspelled Words	Correctness
146.	Counselled → Counseled	Mixed Dialects of English	Correctness
147.	long → prolonged	Word Choice	Engagement
148.	aggressively.	Closing Punctuation	Correctness
149.	haematology → hematology	Mixed Dialects of English	Correctness
150.	therapyand → therapy and, therapy	Misspelled Words	Correctness

151.	the use	Determiner Use (a/an/the/this, etc.)	Correctness
152.	with use of → using	Wordy Sentences	Clarity
153.	patient,	Punctuation in Compound/Complex Sentences	Correctness
154.	a vigilant → a careful	Word Choice	Engagement
155.	32-year-old → 32-year-old	Misspelled Words	Correctness
156.	institute → Institute	Misspelled Words	Correctness
157.	scinces → sciences, science	Misspelled Words	Correctness
158.	the upper	Determiner Use (a/an/the/this, etc.)	Correctness
159.	the last	Determiner Use (a/an/the/this, etc.)	Correctness
160.	2 → two	Improper Formatting	Correctness
161.	A 32 year old male reported to the Department of Periodontics at Maharashtra institute of dental scinces, Latur with a chief complaint of pus discharge and pain in upper front region of jaw since last 2 weeks .	Incomplete Sentences	Correctness
162.	weeks .	Improper Formatting	Correctness
163.	. Medical	Improper Formatting	Correctness
164.	Acomplete → A complete	Misspelled Words	Correctness
165.	was carried	Passive Voice Misuse	Clarity
166.	outand → out and	Misspelled Words	Correctness

167.	Haemoglobin → Hemoglobin	Mixed Dialects of English	Correctness
168.	<i>cumm</i>	Unknown Words	Correctness
169.	ration → ratio	Confused Words	Correctness
170.	<i>Kidney function test Serum creatinine</i>	Intricate Text	Clarity
171.	6 → six	Improper Formatting	Correctness
172.	. Dental	Improper Formatting	Correctness
173.	revealed traumato	Improper Formatting	Correctness
174.	traumato → trauma to	Misspelled Words	Correctness
175.	the labial	Determiner Use (a/an/the/this, etc.)	Correctness
176.	. Ellis	Improper Formatting	Correctness
177.	<i>was suggested</i>	Passive Voice Misuse	Clarity
178.	, which	Punctuation in Compound/Complex Sentences	Correctness
179.	Accordingly,	Comma Misuse within Clauses	Correctness
180.	4 → four	Improper Formatting	Correctness
181.	months ,	Punctuation in Compound/Complex Sentences	Correctness
182.	months ,	Improper Formatting	Correctness
183.	, after	Improper Formatting	Correctness
184.	treatment,	Punctuation in Compound/Complex Sentences	Correctness
185.	, until	Improper Formatting	Correctness

186.	the department	Determiner Use (a/an/the/this, etc.)	Correctness
187.	complains → complaints	Confused Words	Correctness
188.		Intricate Text	Clarity
189.	tract is, or tract was	Incorrect Verb Forms	Correctness
190.	in relation to → about, to, with, concerning	Wordy Sentences	Clarity
191.	reddish pink → reddish-pink	Misspelled Words	Correctness
192.	, Gingival → ; Gingival, , and Gingival, . Gingival	Punctuation in Compound/Complex Sentences	Correctness
193.	. (	Improper Formatting	Correctness
194.	, or	Comma Misuse within Clauses	Correctness
195.	a necrosed	Determiner Use (a/an/the/this, etc.)	Correctness
196.	plaque induced → plaque-induced	Misspelled Words	Correctness
197.	a systemic, or the systemic	Determiner Use (a/an/the/this, etc.)	Correctness
198.	splenectomised → splenectomized	Mixed Dialects of English	Correctness
199.		Intricate Text	Clarity
200.	therapy,	Punctuation in Compound/Complex Sentences	Correctness
201.	, if required	Wordy Sentences	Clarity
202.	the periodontal	Determiner Use (a/an/the/this, etc.)	Correctness

203.	<i>are started</i>	Passive Voice Misuse	Clarity
204.	first → early	Word Choice	Engagement
205.	<i>were performed</i>	Passive Voice Misuse	Clarity
206.	. The	Improper Formatting	Correctness
207.	the necrotic	Determiner Use (a/an/the/this, etc.)	Correctness
208.	<i>was removed</i>	Passive Voice Misuse	Clarity
209.	was → were	Faulty Subject-Verb Agreement	Correctness
210.	usingstainless → using stainless	Misspelled Words	Correctness
211.	ethylenediaminetetraacetic	Confused Words	Correctness
212.	, and	Punctuation in Compound/Complex Sentences	Correctness
213.	<i>was used</i>	Passive Voice Misuse	Clarity
214.	in	Wordy Sentences	Clarity
215.	→ → ., ...	Closing Punctuation	Correctness
216.	, and	Punctuation in Compound/Complex Sentences	Correctness
217.	water based → water-based	Misspelled Words	Correctness
218.	<i>was given</i>	Passive Voice Misuse	Clarity
219.	a period	Determiner Use (a/an/the/this, etc.)	Correctness
220.	period of	Wordy Sentences	Clarity

221.	. The	Improper Formatting	Correctness
222.	, and	Punctuation in Compound/Complex Sentences	Correctness
223.	sign → signs	Incorrect Noun Number	Correctness
224.	done → did, has done	Incorrect Verb Forms	Correctness
225.	a Bio-dentine	Determiner Use (a/an/the/this, etc.)	Correctness
226.	<i>thermoplastisized</i>	Unknown Words	Correctness
227.	.(	Improper Formatting	Correctness
228.	. Post	Improper Formatting	Correctness
229.	done → was done	Incorrect Verb Forms	Correctness
230.	<i>was re-examined</i>	Passive Voice Misuse	Clarity
231.	a review	Determiner Use (a/an/the/this, etc.)	Correctness
232.	gutta-percha → gutta-percha	Misspelled Words	Correctness
233.	<i>was confirmed</i>	Passive Voice Misuse	Clarity
234.	. Patient	Improper Formatting	Correctness
235.	The patient	Determiner Use (a/an/the/this, etc.)	Correctness
236.	<i>was planned</i>	Passive Voice Misuse	Clarity
237.	<i>was performed</i>	Passive Voice Misuse	Clarity
238.	a local	Determiner Use (a/an/the/this, etc.)	Correctness
239.	anaesthetic → anesthetic	Mixed Dialects of English	Correctness

240.	. Trapezoidal	Improper Formatting	Correctness
241.	was planned	Passive Voice Misuse	Clarity
242.	full thickness → full-thickness	Misspelled Words	Correctness
243.	were raised	Passive Voice Misuse	Clarity
244.	at	Wordy Sentences	Clarity
245.	full thickness → full-thickness	Misspelled Words	Correctness
246.	the periapical	Determiner Use (a/an/the/this, etc.)	Correctness
247.	bya → by a, by	Misspelled Words	Correctness
248.	osteotomy produced	Improper Formatting	Correctness
249.	root end → root-end	Misspelled Words	Correctness
250.	, filling	Punctuation in Compound/Complex Sentences	Correctness
251.	made	Wordy Sentences	Clarity
252.	was → were	Faulty Subject-Verb Agreement	Correctness
253.	continuous sling	Improper Formatting	Correctness
254.	patient-reported	Misspelled Words	Correctness
255.		Intricate Text	Clarity
256.	periradicular	Unknown Words	Correctness
257.	surgery → medicine, operation	Word Choice	Engagement
258.	dontically → domestically, identically	Misspelled Words	Correctness

259.	<i>be assessed</i>	Passive Voice Misuse	Clarity
260.	. Only	Improper Formatting	Correctness
261.	apice → pico, apical	Misspelled Words	Correctness
262.	<i>is based</i>	Passive Voice Misuse	Clarity
263.	<i>be extracted</i>	Passive Voice Misuse	Clarity
264.	compared → examined	Word Choice	Engagement
265.	,the → ; the, , and the, . The	Punctuation in Compound/Complex Sentences	Correctness
266.	outcome → issue, result	Word Choice	Engagement
267.	low → flat	Word Choice	Engagement
268.	compared to → than	Wordy Sentences	Clarity
269.	important → vital	Word Choice	Engagement
270.	perie → period	Misspelled Words	Correctness
271.	in particular → particularly	Wordy Sentences	Clarity
272.	buccal → oral	Word Choice	Engagement
273.	with	Wordy Sentences	Clarity
274.	prior to → before	Wordy Sentences	Clarity
275.	width → diameter	Word Choice	Engagement
276.	<i>been recommended</i>	Passive Voice Misuse	Clarity
277.	root end → root-end	Misspelled Words	Correctness
278.	an ideal → a perfect	Word Choice	Engagement

279.	material → article	Word Choice	Engagement
280.	an asplenic	Determiner Use (a/an/the/this, etc.)	Correctness
281.	can → could	Faulty Tense Sequence	Correctness
282.	occurred → happened	Word Choice	Engagement
283.	is known	Passive Voice Misuse	Clarity
284.	. Still, generally	Hard-to-read text	Clarity
285.	influenzae	Unknown Words	Correctness
286.	, and	Comma Misuse within Clauses	Correctness
287.	aeruginosa	Unknown Words	Correctness
288.	been shown	Passive Voice Misuse	Clarity
289.	prophylactic → preventive	Word Choice	Engagement
290.	infection → disease	Word Choice	Engagement
291.	, and	Punctuation in Compound/Complex Sentences	Correctness
292.	indiscriminatory → discriminatory, in discriminatory	Misspelled Words	Correctness
293.	34There is evidence of prophylactic antimicrobial therapy failing to prevent infection in asplenic patients,' and numerous animal studies have cast doubt on its efficacy35,36Because compliance with long term, routine antibiotic prophylaxis is unreliable and its efficacy remains unproven in prospect...	Hard-to-read text	Clarity
294.	The patient	Determiner Use (a/an/the/this,	Correctness

		etc.)	
295.	i.e → i.e.	Comma Misuse within Clauses	Correctness
296.	were no → were no, were	Misspelled Words	Correctness
297.	of any → of any	Improper Formatting	Correctness
298.	procedure patient	Improper Formatting	Correctness
299.	patient underwent	Improper Formatting	Correctness
300.	e.g → e.g.	Comma Misuse within Clauses	Correctness
301.	<i>Patient was on medication (i.e Tab.Pentid 400 mg once a day, contained penicillin G potassium) for last 14 years which was prescribed by his physician, there wereno history of any complication after taking this antibiotic dose, no history of any surgical procedure patient underwent during this ...</i>	Hard-to-read text	Clarity
302.	surgery,	Punctuation in Compound/Complex Sentences	Correctness
303.	,after → ; after, . After	Punctuation in Compound/Complex Sentences	Correctness
304.	, after	Improper Formatting	Correctness
305.	procedure,	Punctuation in Compound/Complex Sentences	Correctness
306.	<i>was suggested</i>	Passive Voice Misuse	Clarity
307.	eertain → specific	Word Choice	Engagement
308.	perioperative period	Misspelled Words	Correctness
309.	thechance → the chance	Misspelled Words	Correctness

310.	educationand → education and	Misspelled Words	Correctness
311.	, use	Improper Formatting	Correctness
312.	antimicrobialmouthrinses	Unknown Words	Correctness
313.	infection → contamination	Word Choice	Engagement
314.	are urged	Passive Voice Misuse	Clarity
315.	The risk	Determiner Use (a/an/the/this, etc.)	Correctness
316.		Intricate Text	Clarity
317.	a number of → several, some, many	Wordy Sentences	Clarity
318.	, and	Comma Misuse within Clauses	Correctness
319.	, or	Comma Misuse within Clauses	Correctness
320.	is believed	Passive Voice Misuse	Clarity
321.	It is believed that in → In	Wordy Sentences	Clarity
322.	the reduction	Determiner Use (a/an/the/this, etc.)	Correctness
323.		Intricate Text	Clarity
324.	, asplenic → ; asplenic, , and asplenic, . Asplenic	Punctuation in Compound/Complex Sentences	Correctness
325.	have been shown to be → are	Wordy Sentences	Clarity
326.	the removal	Determiner Use (a/an/the/this, etc.)	Correctness
327.	with removal of → by removing	Wordy Sentences	Clarity

328.	splenectomised → splenectomized	Mixed Dialects of English	Correctness
329.		Intricate Text	Clarity
330.	. Treatment	Improper Formatting	Correctness
331.	evaluation of → evaluating	Wordy Sentences	Clarity
332.	are living → live	Wordy Sentences	Clarity
333.	an important → a vital, a critical	Word Choice	Engagement
334.	Similarly,	Comma Misuse within Clauses	Correctness
335.	, and	Punctuation in Compound/Complex Sentences	Correctness
336.	definitely	Wordy Sentences	Clarity
337.	be not only knowledgeable	Faulty Parallelism	Correctness
338.		Intricate Text	Clarity
339.	to	Wordy Sentences	Clarity
340.	splenectomised → splenectomized	Mixed Dialects of English	Correctness
341.	, Chueh	Improper Formatting	Correctness
342.	<i>periradicular</i>	Unknown Words	Correctness
343.	<i>periradicular</i>	Unknown Words	Correctness
344.	, PV.	Improper Formatting	Correctness
345.	Restor → Restore	Misspelled Words	Correctness
346.	Styrt → Start	Misspelled Words	Correctness

347.	Schummacher → Schumacher	Misspelled Words	Correctness
348.	babesia → babesia	Misspelled Words	Correctness
349.	, 1975	Punctuation in Compound/Complex Sentences	Correctness
350.	; l:516	Improper Formatting	Correctness
351.	Stevemse → Stevens	Misspelled Words	Correctness
352.		Intricate Text	Clarity
353.	standards → Standards	Misspelled Words	Correctness
354.	Task force → Taskforce	Confused Words	Correctness
355.	, ReganJD	Improper Formatting	Correctness
356.	, GutmannJL.the	Improper Formatting	Correctness
357.	, and	Comma Misuse within Clauses	Correctness
358.	one visit → one-visit	Misspelled Words	Correctness
359.	Zuole → Solo, Zolo	Misspelled Words	Correctness
360.	<i>periradicular</i>	Unknown Words	Correctness
361.	a prospective clinical	Misplaced Words or Phrases	Correctness
362.		Intricate Text	Clarity
363.	Vinzons → Vincent	Misspelled Words	Correctness
364.	rgin → in	Misspelled Words	Correctness
365.	resurgery → surgery	Misspelled Words	Correctness
366.	Nisongard → Isengard	Misspelled Words	Correctness

367.	, 1987	Punctuation in Compound/Complex Sentences	Correctness
368.	, 1984	Punctuation in Compound/Complex Sentences	Correctness
369.	penicillin is, or penicillin was	Incorrect Verb Forms	Correctness
370.	...	Misuse of Semicolons, Quotation Marks, etc.	Correctness
371.	, and	Comma Misuse within Clauses	Correctness
372.	Haemotol → Haematol	Misspelled Words	Correctness
373.	haematology → hematology	Mixed Dialects of English	Correctness
374.	the spleen	Determiner Use (a/an/the/this, etc.)	Correctness
375.	Cross section → Cross-section	Misspelled Words	Correctness
376.	the spleen	Determiner Use (a/an/the/this, etc.)	Correctness
377.	the necrotic	Determiner Use (a/an/the/this, etc.)	Correctness
378.	pulp,	Punctuation in Compound/Complex Sentences	Correctness
379.	was achieved	Passive Voice Misuse	Clarity
380.	Water based → Water-based	Misspelled Words	Correctness
381.	thermoplastisized	Unknown Words	Correctness
382.	gutta percha → gutta-percha	Misspelled Words	Correctness
383.	Full thickness → Full-thickness	Misspelled Words	Correctness
384.	t,	Improper Formatting	Correctness

385.	sling eling	Misspelled Words	Correctness
386.	1 → one	Improper Formatting	Correctness
387.	1 → one	Improper Formatting	Correctness
388.	<i>Following splenectomy, individuals have an elevated risk of infection, in particular to encapsulated bacteria, Gram-negative pathogens such as Capnocytophagia carnimorsus and Bordetella holmesii,</i>	[Full text] Post-splenectomy sepsis: preventative ... https://www.dovepress.com/post-splenectomy-sepsis-preventative-strategies-challenges-and-solutio-peer-reviewed-fulltext-article-IDR	Originality
389.	<i>After the failure of the conventional root canal treatment,</i>	A case of periradicular surgery: apicoectomy and ... https://sdsjournal.com/article/view/1747/	Originality
390.	<i>an apicoectomy was well defined in 1884 by J. Farrar as "a bold act, which removes the entire cause [of disease]and which will lead to a permanent cure may not be the best in the end, but the most</i>	A case of periradicular surgery: apicoectomy and ... https://sdsjournal.com/article/view/1747/	Originality
391.	<i>resection and preparation, the root canal filling is placed within the created cavity to close the path of communication between infected root canal system and</i>	A case of periradicular surgery: apicoectomy and ... https://sdsjournal.com/article/view/1747/	Originality
392.	<i>1)Radiological findings of apical periodontitis and/or symptoms associated with an obstructed canal (the obstruction proved not to be removable, displacement did not seem feasible or the risk of damage was too great). (2)Extruded material with clinical or radiological findings of apical periodontit...</i>	Quality guidelines for endodontic treatment: consensus ... https://onlinelibrary.wiley.com/doi/full/10.1111/j.1365-2591.2006.01180.x	Originality
393.	<i>is inappropriate. (4)Perforation of the root or the floor of the pulp chamber</i>	Quality guidelines for endodontic treatment: consensus ...	Originality

	<i>and where it is impossible to treat from within the pulp cavity.</i>	https://onlinelibrary.wiley.com/doi/full/10.1111/j.1365-2591.2006.01180.x	
394.	<i>the tooth has no function (no antagonist, no strategic importance serving as a pillar for a fixed prothesis</i>	(PDF) Endodontic Surgery -A Review https://www.researchgate.net/publication/333405537_Endodontic_Surgery_-A_Review	Originality
395.	<i>the tooth has inadequate periodontal support, or the tooth has a vertical root fracture. Additional general contra- indications may be an uncooperative patient or a patient with a compromised medical history for an oral surgical</i>	(PDF) Endodontic Surgery -A Review https://www.researchgate.net/publication/333405537_Endodontic_Surgery_-A_Review	Originality
396.	<i>Patients who have undergone splenectomy are known to</i>	Recommended Treatment for Antibody-mediated Rejection ... https://journals.lww.com/transplantjournal/Fulltext/2020/05000/Recommended_Treatment_for_Antibody_mediated.11.aspx	Originality
397.	<i>The spleen plays an important role in the body's</i>	Dental considerations in asplenic patients — Augusta ... https://augusta.pure.elsevier.com/en/publications/dental-considerations-in-asplenic-patients	Originality
398.	<i>mechanism against microbial infections. However, trauma or diseases sometimes make removal of this important organ necessary,which predisposes patients to certain infections. This increased risk of infection and the underlying reason for the organ's removal both may affect the provision of dental c...</i>	Dental considerations in asplenic patients — Augusta ... https://augusta.pure.elsevier.com/en/publications/dental-considerations-in-asplenic-patients	Originality
399.	<i>Spleen function: Immunological function The spleen can initiate immune responses to blood-borne antigens, produce antibodies, and</i>	[Full text] Post-splenectomy sepsis: preventative ... https://www.dovepress.com/post-splenectomy-sepsis-	Originality

	<i>clear antibody-mediated pathogens. The spleen consists of cells involved in both innate and adaptive immunity.</i>	preventative-strategies-challenges-and-solutio-peer-reviewed-fulltext-article-IDR	
400.	<i>Red pulp macrophages filter the blood and remove bacteria, damaged erythrocytes, and erythrocyte inclusions. Marginal zone macrophages remove cellular debris in the marginal zone and tingible body macrophages</i>	[Full text] Post-splenectomy sepsis: preventative ... https://www.dovepress.com/post-splenectomy-sepsis-preventative-strategies-challenges-and-solutio-peer-reviewed-fulltext-article-IDR	Originality
401.	<i>tingible body macrophage is a type of macrophage predominantly found in germinal</i>	Tingible body macrophage - Wikipedia https://en.wikipedia.org/wiki/Tingible_body_macrophage	Originality
402.	<i>containing many phagocytized, apoptotic cells in various states of degradation, referred to as tingible</i>	Tingible body macrophage - Wikipedia https://en.wikipedia.org/wiki/Tingible_body_macrophage	Originality
403.	<i>remove B-cell debris in the germinal center of the follicle. In addition to macrophages, there are also dendritic cells, natural killer cells, and monocytes that are involved in inducing T cell responses to pathogens.</i>	[Full text] Post-splenectomy sepsis: preventative ... https://www.dovepress.com/post-splenectomy-sepsis-preventative-strategies-challenges-and-solutio-peer-reviewed-fulltext-article-IDR	Originality
404.	<i>The white pulp of the spleen is B-cell dominant (follicles) with some T cell zones. Splenic B cells</i>	[Full text] Post-splenectomy sepsis: preventative ... https://www.dovepress.com/post-splenectomy-sepsis-preventative-strategies-challenges-and-solutio-peer-reviewed-fulltext-article-IDR	Originality
405.	<i>The spleen also sequesters blood cells including platelets. The spleen is thought to pool approximately one-third of the total platelet volume in addition to sequestration of erythrocytes and granulocytes. Tests of splenic function evaluate the</i>	[Full text] Post-splenectomy sepsis: preventative ... https://www.dovepress.com/post-splenectomy-sepsis-preventative-strategies-challenges-and-solutio-peer-reviewed-fulltext-article-IDR	Originality

capacity of the spleen to remove intra-erythrocytic in...

406.	<i>Medical history revealed that he was diagnosed with</i>	Turkish Journal of Vascular Surgery http://www.turkishjournalofvascularsurgery.org/abstract.php?id=257	Originality
407.	<i>Discussion After the failure of the conventional root canal treatment (RCT), non-surgical retreatment is the preferred option in most cases. Several factors, such as a complex root canal system or previous procedural accidents, may impede the success of non-surgical retreatment. In these cases, pe...</i>	A case of periradicular surgery: apicoectomy and ... https://sdsjournal.com/article/view/1747/	Originality
408.	<i>Only a few clinical studies have compared the</i>	A retrospective comparison of Escherichia coli and ... https://www.spandidos-publications.com/ol/15/1/75	Originality
409.	<i>obturation, and many studies have attempted to identify an ideal material; however, an ideal material has not been</i>	A case of periradicular surgery: apicoectomy and ... https://sdsjournal.com/article/view/1747/	Originality
410.	<i>Patients who have undergone splenectomy are known to</i>	Recommended Treatment for Antibody-mediated Rejection ... https://journals.lww.com/transplantjournal/Fulltext/2020/05000/Recommended_Treatment_for_Antibody_mediated.11.aspx	Originality
411.	<i>is associated with a number of diseases and</i>	Regulatory T Cells and Influenza	Originality
412.	<i>individual is often severe and associated with high morbidity and mortality. Ongoing prevention with vaccination, antibiotic prophylaxis, and patient education is imperative in reducing the risk of infection.</i>	[Full text] Post-splenectomy sepsis: preventative ... https://www.dovepress.com/post-splenectomy-sepsis-preventative-strategies-challenges-and-solutio-peer-reviewed-fulltext-article-IDR	Originality

413.	<i>The burden is on the general dentist to</i>	What's the Difference Between a Dentist and an ... https://patch.com/connecticut/avon/whats-difference-between-dentist-orthodontist-0	Originality
414.	<i>Quality guidelines for endodontic treatment: consensus report of the European Society of Endodontology.</i>	Quality guidelines for endodontic treatment: consensus ... https://onlinelibrary.wiley.com/doi/full/10.1111/j.1365-2591.2006.01180.x	Originality
415.	<i>Lewis SM, Williams A, Eisenbarth SC. Structure and function of the immune system in the spleen. Sci Immunol. 2019;4:33.</i>	[Full text] Post-splenectomy sepsis: preventative ... https://www.dovepress.com/post-splenectomy-sepsis-preventative-strategies-challenges-and-solutio-peer-reviewed-fulltext-article-IDR	Originality
416.	<i>Susceptibility to infection after splenectomy performed in infancy. Ann Surg 1952;136:</i>	[Full text] Post-splenectomy sepsis: preventative ... https://www.dovepress.com/post-splenectomy-sepsis-preventative-strategies-challenges-and-solutio-peer-reviewed-fulltext-article-IDR	Originality
417.	<i>Guidelines for the prevention and treatment of infection in patients with an absent or dysfunctional spleen. Prepared on behalf of the British Committee for standards in Haematology</i>	Update of guidelines for the prevention and treatment of ... https://www.rcpjournals.org/content/clinmedicine/2/5/440.full-text.pdf	Originality
418.	<i>Tawil PZ, Trope M, Curran AE, Caplan DJ, Kirakozova A, Duggan DJ, Teixeira FB. Periapical microsurgery: an in vivo evaluation of endodontic root-end filling materials. J Endod 2009;35:357-62.</i>	A case of periradicular surgery: apicoectomy and ... https://sdsjournal.com/article/view/1747/	Originality

dr om periodontal surgeries case report

by MIDSR Dental

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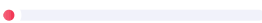
16
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242	Correctness	
52	Misspelled words	
80	Determiner use (a/an/the/this, etc.)	
27	Improper formatting	
2	Incorrect verb forms	
21	Punctuation in compound/complex sentences	
8	Confused words	
7	Incomplete sentences	
14	Comma misuse within clauses	
5	Wrong or missing prepositions	
1	Pronoun use	
3	Text inconsistencies	
7	Unknown words	
6	Incorrect noun number	
5	Faulty subject-verb agreement	
3	Misplaced words or phrases	
1	Closing punctuation	
21	Engagement	
20	Word choice	
1	Monotonous sentences	
95	Clarity	
50	Passive voice misuse	
16	Intricate text	
21	Wordy sentences	

- 7** Hard-to-read text 
 - 1** Word choice 

 - 1** **Delivery**
 - 1** Inappropriate colloquialisms 
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dr om periodontal surgeries case report

1

(Dr. Om Baghele. Perio. Preliminary draft)

360 | Advanced periodontal surgeries- report of 2 cases with one year¹ follow-up.

Abstract:

Advanced periodontal surgeries are amelioration and furtherance of conventional basic² periodontal surgeries³. Advanced periodontal surgeries emphasize on different regenerative procedures to reconstruct lost hard and soft tissue. These may employ combination⁴ of twoor⁵ more different surgical procedures, modification in incision & suturing technique, exploit different materials, and interdisciplinary approach for favorable treatment

361 | outcomes.This case report illustrating 2 cases with one year⁶ follow-up period⁷ which had been treated by utilizing principles of advanced periodontal⁸ surgeries.⁹ First case describes interdisciplinary¹⁰ approach for management of¹¹ adjacent defects namely: Siebert's Class III ridge defect and periapical¹² cyst.¹³ Second case is management of palatal perforation associated with large¹⁴ peri-radicular cyst.¹⁵

362 | KEY WORDS:^{16,17}
Advanced Periodontal Surgery, Amnion Membrane, Demineralized Freeze Dried¹⁸ Bone Graft,¹⁹
Palatal perforation, Periapical Cyst, Ridge Augmentation.²⁰

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Advanced periodontal surgeries- report of twocases with one year follow-up.

Introduction:

364 | Periodontal surgery is an essential part of modern dentistry. The focus of
periodontal surgical procedure has shifted over past three decades from
resection (loss) to regeneration (gain). This leap from resection to regeneration
narrates progression in periodontal surgeries from the last century to current
365 | scenario. The ultimate goal of periodontal surgery is to regenerate lost
periodontal tissue to restore normal function, esthetics, phonetics and
366 | increase life-expectancy of teeth. This can be done by selection of appropriate
surgical techniques and modifying the routine techniques on case to case
basis.

Following case series comprises of two unusual cases which have been
managed by interdisciplinary approach.

Case 1:

A 38-year-old female patient reported to the Department of Periodontology,
with missing right maxillary central incisor and recurrent discharge of pus in
relation to maxillary left lateral incisor since the last 4 months.

Her medical history did not reveal any systemic disease. There was a history of
accident 4 months back after which her maxillary right central incisor was
extracted due to increased mobility. Dental history also revealed root canal
treatment followed by Porcelain Fused to Metal (PFM) crown with maxillary left
lateral incisor, 3 months back. But patient complained of pus discharge from
labial aspect of maxillary left lateral incisor one month after root canal
treatment. Presently, clinical and radiographic examinations revealed a

Seibert's Class-III alveolar ridge defect^{51,5} in the edentulous region. Periodontal
pocket of 7 mm was present on mesial⁵³ aspect of maxillary⁵⁴ left central incisor
adjacent to edentulous⁵⁵ area. Radiographic⁵⁶ evaluation also revealed large
periapical radiolucency⁵⁷ at the apex of root canal treated maxillary left lateral
incisor suggestive of periapical cyst/ granuloma.⁵⁸

After complete⁵⁹ evaluation of history, clinical condition, radiographic
investigations, ridge augmentation using demineralized freeze dried bone⁶⁰
allograft (DFDBA) and amnion membrane (AM) at the defective area in the⁶¹
maxillary alveolar ridge followed by conventional Fixed Partial Denture (FPD) to
improve the esthetics & for management of periapical cyst apicoectomy with
root end⁶² filling using Mineral Trioxide Aggregate (MTA) was planned^{63 64}. All the
 possible treatment options were discussed⁶⁵ with the patient & she gave
 consent for the above procedure in one surgical appointment.

SURGICAL PROCEDURE:

After administration of⁶⁶ local anesthesia, a submarginal incision was given using⁶⁷
a No. 15 scalpel blade extending from the mesial⁶⁸ aspect of left central incisor
to mesial⁶⁹ aspect of canine. Submarginal⁷⁰ incision was chosen for esthetic⁷¹
purpose to prevent⁷² exposure of PFM⁷³ crown margin postoperatively.⁷⁴ Two vertical
releasing incisions⁷⁵ were made to gain access to the apex of the root. By using
appropriate periosteal elevators, a full thickness mucoperiosteal flap was⁷⁶
raised.⁷⁷ Labially the bony window was enlarged⁷⁸, and thorough curettage of⁷⁹
periapical area was carried out. Root end⁸⁰ resection⁸¹ followed by retrograde⁸²
filling using MTA was done.⁸³ Partial Suturing on distal side was completed.⁸⁴

For augmentation of localized ridge defect, a crevicular incision was given on⁸⁷
the mesial⁸⁸ aspect of left central incisor which⁸⁹ continued as a crestal⁹⁰ incision
over the edentulous span till the mesial aspect of maxillary⁹¹ right lateral incisor,
splitting its mesial papilla.⁹² Two vertical releasing incisions were also given⁹³

.Upon⁹⁴ elevation of full thickness⁹⁵ mucoperiosteal flap, large⁹⁶ vertical ridge defect measuring 5mm in width and 13mm in depth was noticed. Measurement of defect⁹⁷ was made⁹⁸ from a horizontal line taken at the CEJ of maxillary⁹⁹ left central incisor. In addition, there was loss of the crestal height (7 mm)^{100,101} on mesial and¹⁰² buccal¹⁰³ aspect of maxillary left central incisor, After complete debridement, a series of cortical perforations¹⁰⁴ were performed¹⁰⁵ using a round bur¹⁰⁶ under saline¹⁰⁷ irrigation to promote migration of hematopoietic cells into the wound space.¹⁰⁸ Demineralized freeze-dried irradiated bone allograft; average particle size (500µm), [Tata Memorial Hospital Tissue Bank, Mumbai] was directly¹⁰⁹ compacted into the ridge defect. After placement of bone allograft, freeze-dried irradiated amnion membrane of size 3x3cm² was placed.¹¹⁰ [Tata Memorial Hospital Tissue Bank, Mumbai]. After coming in contact with blood at the surgical site, AM quickly hydrates and was then adapted with hand instruments. AM was extended >3mm beyond defect borders. The mucoperiosteal flap¹¹¹ was approximated with interrupted sutures. Periodontal¹¹² pack was applied¹¹³ on the surgical area.¹¹⁴ Patient¹¹⁶ was reexamined¹¹⁷ after 24 hr and no post surgical¹¹⁸ complications¹¹⁹ were revealed.¹²⁰ Periodontal pack & sutures¹²¹ were removed after one week. Upon follow up examination, at the end of first¹²² week¹²³ there was absence¹²⁴ of pus discharge. The labio-palatal contours and height of the alveolar ridge were now acceptable to place an esthetic¹²⁵ FPD.

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The current case¹²⁶, describes two adjacent defects -Siebert's Class III alveolar ridge defect¹ with maxillary right central incisor region and periapical cyst with maxillary left lateral incisor, making this a complex¹²⁷ case to treat. Studies have shown good results for treatment¹²⁸ of infrabonydefect¹²⁹ with bone grafts and amnion membrane.² Hence it was decided to use DFDBA+ AM for ridge augmentation.^{131,132} This is one of the first reports (2014), which used DFDBA+AM for

ridge augmentation. Placental allografts have ¹³³ been used in medicine for over 100 years. Their ¹³⁴ initial use can be traced ¹³⁵ back to ¹³⁶ early 1990s in skin wound applications and have been later used in ophthalmologic surgeries ¹³⁷ as well. Use of placental allografts in dentistry is a more ¹³⁸ recent development, with the first commercially available product being released in 2008.² The currently available dental form of ¹³⁹ placental allograft is composed of cryopreserved, dehydrated amnion laminate. ¹⁴⁰ AMs possess a ¹⁴¹ variety of proteins that provide a bioactive matrix to facilitate ¹⁴² wound healing, including collagen types I, III, IV, V, and VI; 6 laminin-5; platelet-derived growth factor- α (PDGF- α); PDGF- β , fibroblast growth factor; and transforming growth factor. ¹⁰¹ In addition to providing a bioactive matrix, studies have shown placental barriers to have antibacterial properties³ and to reduce inflammation via inhibition of macrophages and polymorphonuclear neutrophils.⁴ Advantage of AM is it is extremely thin ¹⁴³ (300 μ m), ¹⁴⁴ self adhering, requires no suture for fixation & no precise trimming for adaptation. ¹⁴⁵ DFDBA has the potential for osteoinduction with more expression of ¹⁴⁶ bone morphogenetic protein (BMP) & has shown ¹⁴⁷ excellent result in regenerative therapy.^{5,6,7} In this case ¹⁴⁸ Post operative results after ¹⁴⁹ 1 year ¹⁵⁰ showed ¹⁵¹ completely filled buccal ridge concavity making it esthetically acceptable for a fixed prosthesis. ¹⁵² The radiographs with maxillary left lateral incisor also revealed reduction in radiolucency in the ¹⁵³ periapical area, suggestive of repair in that region. ¹⁵⁴ MTA was chosen as a ¹⁵⁵ root end filling material ¹⁵⁶ by virtue of its properties such as low toxicity, biocompatibility, antibacterial action, reduced microleakage and ¹⁵⁸ favorable response to osteoblast. Two different ¹⁵⁹ procedure for two different ¹⁶⁰ indications can be combined successfully to produce ¹⁶¹ remarkable ¹⁶² result.

Case 2:

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A 27-year-old male patient reported to the department of endodontics with a chief complaint of discoloration of upper front teeth since past ¹⁶³ 7 ¹⁶⁴ years and persistent palatal perforation since ¹⁶⁵ past 2 years. There was a history of trauma 7 yrs ago in relation to ¹⁶⁶ maxillary ¹⁶⁷ anterior area which ¹⁶⁸ led to discoloration of upper front teeth. Patient ¹⁶⁹ also experienced recurrent draining sinuses on labial as well as ¹⁷⁰ palatal aspect ¹⁷¹ with respect to maxillary left central & lateral incisor ¹⁷² since past 2 yrs. Healing with scar ¹⁷³ was seen with labial sinus tracts, however palatal sinus tract did not resolve since then causing ¹⁷⁴ food accumulation, putrefaction and ¹⁷⁵ bad breath. There was no associated pain and swelling in relation to ¹⁷⁶ palatal perforation. Patient ^{177,178} gave history of some kind of ¹⁷⁹ surgery performed in a private clinic for the same area 6 months back but could not provide the details of the same. ¹⁸⁰

Intraoral examination revealed the presence of ¹⁸¹ 7mm palatal sinus opening 3cm away from maxillary left lateral incisor and at 8mm distance from mid-palatine raphe. Due to its root position, periapical ¹⁸² lesion ¹⁸³ associated with maxillary lateral incisor ¹⁸⁴ usually drains palatally. No active pus drainage through the stoma of the sinus tracts and proliferation of the mucosal epithelium ¹⁸⁵ were ¹⁸⁶ evident. He did not report any symptoms of nasal regurgitation suggestive of no oro-nasal/ oro-antral communication. Upon clinical examination, discoloration of maxillary left central & lateral incisors ¹⁸⁷ observed and access of these teeth were ¹⁸⁸ found open. ¹⁸⁹

A periapical radiograph disclosed the presence of ¹⁸⁹ an unilocular, ¹⁹⁰ well defined ¹⁹¹ radiolucency measuring 1.5 x 1.2mm involving maxillary left incisors and canine.

Occlusal view of maxilla revealed periapical radiolucency involving left maxillary anteriors & an open apex in relation to ¹⁹² maxillary left lateral incisor.

For further radiographic evaluation, Cone beam ¹⁹³ Computed tomography ¹⁹⁴ was ¹⁹⁵ performed. The images showed well defined, unilocular, oval radiolucent structure measuring 11.38x11.45x11.87mm in relation to maxillary left ¹⁹⁶ anteriors. ¹⁹⁷ The three dimension ¹⁹⁸ images showed complete loss of buccal as well ¹⁹⁹ as ²⁰⁰ palatal cortical plate over maxillary left incisors and canine ²⁰¹. ²⁰² Based on radiographic and clinical observation, ²⁰³ diagnosis of radicular cyst with ²⁰⁴ persistent sinus with maxillary left incisors and canine ²⁰⁵ was confirmed.

The treatment plan included root canal therapy with respect to maxillary ²⁰⁶ left incisors and canine. Surgical ²⁰⁷ phase ²⁰⁸ was planned in two stages. In the first ^{209,210} stage, ²¹¹ palatal rotational pedicle flap for coverage of palatal perforation ²¹² was ²¹³ planned ²¹⁴ and surgical management of the cyst was employed in 2nd stage ²¹⁵ which ²¹⁶ included cyst enucleation and apicectomy in relation to ²¹⁷ maxillary left ²¹⁸ incisors and canine. ²¹⁹ Treatment options for discoloration in relation to ²²⁰ maxillary left ²²¹ incisors included walking bleach followed by a composite build up ²²² or a ²²³ full ²²⁴ coverage ²²⁵ restoration.

In the first stage of surgery ²²⁰ the palatal sinus tract was closed using a palatal rotational pedicle flap (partial thickness ²²¹ flap) taken from a site immediately adjacent to the perforation. Sinus ²²² tract was de-epithelialized. The flap was then rotated over palatal perforation, approximated and ²²³ then sutured into place over the sinus. Gel foam ²²⁴ cubes were placed on the raw donor site and secured with sutures. The surgery was planned in two appointments considering a possible communication between periapical ²²⁵ lesion and palatal perforation and a need for bone augmentation.

The second stage of surgery was executed ²²⁶ after ²²⁷ complete ²²⁸ healing of ²²⁹ palatal ²³⁰ surgical ²³¹ site.

For surgical enucleation of the cyst, a buccal approach was adopted ²²⁹ and ²³⁰ a ²³¹ full thickness ²³² flap ²³³ was raised ²³⁴ from mesial line angle of maxillary right central

incisor to mesial line angle of maxillary left first premolar. A ²³⁵large bony lesion ²³⁶was revealed involving apices of ²³⁷maxillary left incisors. ²³⁸Following the careful curettage of the granulation tissue, root resection ²³⁹was performed with maxillary left ²⁴⁰incisors and canine. MTA ²⁴¹root end filling ²⁴²was placed as a sealing material. The area of resorption ²⁴³was filled with DFDBA medium particle size (<1000µm), [Tata Memorial Hospital Tissue Bank, Mumbai] ²⁴⁴which was ²⁴⁵sandwiched between two ²⁴⁶amniotic membranes ²⁴⁷of size 3x3cm². [Tata Memorial Hospital Tissue Bank, Mumbai]. Then the flap was closed with interrupted sutures. The ²⁴⁸postoperative period was uneventful. The patient was free of symptoms and had no complaints in the next 4-month follow-up period. Complete closure of the palatal sinus ²⁴⁹was observed with no residual morbidity at the surgical site. Radiographic examination of ²⁵⁰radicular cyst with maxillary left incisors and canine also showed signs of healing.

³⁶⁹ ²⁵¹Sinus tract ²⁵²is defined as a channel leading from an enclosed area of inflammation to an epithelial surface. ^{253,254}The sinus tract is a strong motive that forces the patient to seek dental treatment, and closure of the tract after a ²⁵⁵debridement appointment is an excellent indication of healing, which is equally ²⁵⁶obvious and impressive to the patient as well. ²⁵⁷Generally odontogenic sinus ²⁵⁸tracts heal with proper endodontic treatment, but in this ²⁵⁹case surgical ²⁶⁰intervention was required due to persistent sinus tract even after proper endodontic treatment. ²⁶¹Radicular ²⁶²cysts are the most common (52%–68%) cystic ³⁷⁰lesions affecting the jaw.⁹ They are commonly found at the apices of involved teeth and sometimes lateral to accessory root canals. ²⁶³During a 6 months follow up visit, ²⁶⁴uneventful healing of the palatal sinus was achieved by the use of ²⁶⁵appropriate ²⁶⁶surgical technique. ^{267,268}Use of distinctive ²⁶⁹combination of DFDBA with ²⁷⁰amniotic membrane for management of radicular ²⁷¹cyst may also have helped in ²⁷²achieving excellent results.

Discussion:

The scope of periodontal surgeries is expanding ²⁷³ and we are progressing beyond what is a typical periodontal procedure limited to periodontal hard and soft tissues. Owing to the involvement of distant tissues ²⁷⁴ along with the afflictions of periodontal tissues, we have to think beyond ²⁷⁵ and rather than restricting ourselves only to ²⁷⁶ strict periodontal ²⁷⁷ area we have to explore more and incorporate or modify our surgical approach. Long back, periodontal therapy was limited to the prevention, diagnosis ²⁷⁸ and treatment of diseases of the supporting and surrounding tissues of the teeth, ²⁷⁹ now it is extended to implants as well. Decades ²⁸⁰ ago periodontal surgical procedures were typically ²⁸¹ resective in nature. The goals of these procedures were to debride the roots and increase ²⁸² the ²⁸³ cleansibility of the teeth by reducing pocket depths and modifying furcation defects, often via root removal. ²⁸⁴ The value of this form of therapy on the overall retention of teeth is high, and it remains valid as a treatment modality till now. ²⁸⁵ The unfortunate consequences of this mode of therapy include increased root exposure and decreased papillary height due to apical repositioning of the ²⁸⁷ osseous crest and free gingival margin. ²⁸⁸ ²⁸⁹ To overcome these problems, the need for regenerative surgical procedures arose ²⁹⁰ and ²⁹¹ later on these procedures can be further modified to tentatively term them advanced periodontal ²⁹² surgeries.

These Advanced periodontal surgeries may include:

Combination of 2 or more different surgical procedures, in which conventional periodontal surgery would have produced, compromised results. ²⁹³

Modification in the incisions, suturing techniques as per the case. ²⁹⁴

Procedures in which novel ²⁹⁵ combination of autogenous and non-autogenous ²⁹⁶ material can be used ²⁹⁷ at the time of surgery. ²⁹⁸

Regeneration of lost hard and soft tissue.²⁹⁹

Interdisciplinary approach for exceptional treatment outcome.³⁰⁰

In our cases

Different surgical procedures performed

Material used

Branches involved

Case 1

Ridge augmentation,

apicoectomy

DFDBA, Amnion membrane, MTA

Periodontics, endodontics, prosthodontics

Case 2

Palatal rotational flap,

Cyst enucleation,

apicoectomy

DFDBA, Amnion membrane, MTA, gel foam

Periodontics,

Endodontics

Oral medicine and radiology

A combination of various surgical procedures & materials has been used³⁰¹ in the above cases which³⁰² have shown hard & soft tissue regeneration upon long term follow-up. Hence, these surgeries can be designated³⁰³ as advanced periodontal

surgeries. Due to its ³⁰⁴ wide scope, advanced periodontal surgeries can be ³⁰⁵ considered as a different category. Along with periodontal ³⁰⁶ plastic procedure, conventional periodontal surgical procedure, implant procedure- advanced periodontal surgeries needs ³⁰⁷ further exploration.

Conclusion:

As the demand for esthetic dental procedure ³⁰⁸ has increased, the dental field has responded with improved techniques and materials to address the demand ³⁰⁹. Advanced periodontal surgeries alongwith ³¹⁰ interdisciplinary intervention has ³¹¹ helped in providing a healthy, esthetic and ³¹² functional dentogingival ³¹³ complex. To conclude, unique ³¹⁴ combination of various available materials and appropriate modification of routine surgical procedures, favorable outcomes can be ³¹⁵ achieved.

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Figures:

Fig 1: Seibert Class III ridge defect with 7mm of recession on mesial aspect of 21. Note the labial concavity on edentulous area.

Fig 2: Occlusal view of ridge defect

Fig 3: Labial sinus opening with 22.

Fig 4: Trapezoidal flap with Submarginal incision.

Fig 5: Mucoperiosteal flap raised.

Fig 6: Note the Periapical cyst with 22. Root end resection followed by retrograde filling using MTA was done.

Fig 7: Trapezoidal flap raised for adjacent ridge defect. Notice proximal bone loss with 21. Recipient site preparation done by Decortication of bone.

Fig 8: DFDBA bone graft is sandwiched between amnion membrane.

Fig.9: suturing completed.

Fig 10: 2 months post-operative: occlusal view ²⁴⁸

Fig 11: 2months post-operatively note augmented edentulous span. ⁷⁴

Fig. 12:Prosthesis completed.

Fig 13: Pre-operative radiograph of ridge defect

Fig14: 1 year ³³² post operative ³³³ radiograph

Fig 15: Pre -operative ³³⁴ radiograph of periapical

Fig 16: Post-operative radiograph1 year

Cyst. Gutta percha ³³⁵ point tracing sinus tract

Fig 17: Pre operative ³³⁶ frontal view shows discoloration of 21,22 &scar from previous labial sinus tracts seen.

Fig 18: Persistent palatal sinus tract Fig 19: Periapical and occlusal view showing well defined oval shape radiolucency with 21,22,23

Fig 20: Axial view of CBCT showing palatal sinus tract. Loss of palatal bone from apical third of root. ³³⁷ No involvement of nasal floor ³³⁸ is seen. ³³⁹ Fig 21: transverse

view showing loss of buccal as well as palatal ³⁴⁰ plate with 21,22,23.

Fig 22: 3D view shows loss ³⁴¹ of buccal corticalplate ³⁴² with21,22,23. Oval bony lesion involving ³⁴³ above mentioned ³⁴⁴ teeth.

Fig 23: Palatal view large, round defect communicating to buccal side.

Fig 24: Palatal incision

Fig 25: Partial thickness ³⁴⁵ flap was raised ³⁴⁶

Fig 26: Palatal rotational flap secured with sutures. Raw surface ^{347,348} was filled ³⁴⁹ with gelfoam. ³⁵⁰

Fig 27: Healing after 1year

Fig 28: Crevicular incision with two vertical incision ³⁵¹ given

Fig 29: Full thickness ³⁵² flap was raised, ³⁵³ notice resemblance of defect ³⁵⁴ with CBCT image.Apeciectomy ³⁵⁵ was performed. ³⁵⁶

Fig 30: ³⁵⁷Defect ³⁵⁸was filled with DFDBA bone graft + amnion membrane.

Fig 31: Suturing completed

Fig 32: Post ³⁵⁹one year follow-up.

Fig 33: Occlusal and periapical radiographs after one year

1.	one-year → one-year	Misspelled Words	Correctness
2.	basic → necessary	Word Choice	Engagement
3.	surgeries → medicines, operations	Word Choice	Engagement
4.	a combination	Determiner Use (a/an/the/this, etc.)	Correctness
5.	twoer → two or	Misspelled Words	Correctness
6.	. This	Improper Formatting	Correctness
7.	report is, or report was	Incorrect Verb Forms	Correctness
8.	one-year → a year	Determiner Use (a/an/the/this, etc.)	Correctness
9.	, which	Punctuation in Compound/Complex Sentences	Correctness
10.	<i>been treated</i>	Passive Voice Misuse	Clarity
11.		Intricate Text	Clarity
12.	The first	Determiner Use (a/an/the/this, etc.)	Correctness
13.	an interdisciplinary	Determiner Use (a/an/the/this, etc.)	Correctness
14.	the management	Determiner Use (a/an/the/this, etc.)	Correctness
15.	, namely	Punctuation in Compound/Complex Sentences	Correctness
16.	. Second	Improper Formatting	Correctness
17.	The second	Determiner Use (a/an/the/this, etc.)	Correctness

18.	the management	Determiner Use (a/an/the/this, etc.)	Correctness
19.	the large	Determiner Use (a/an/the/this, etc.)	Correctness
20.	KEY WORDS → KEYWORDS	Confused Words	Correctness
21.	Freeze Dried → Freeze-Dried	Misspelled Words	Correctness
22.	Palatal perforation, Periapical Cyst, Ridge Augmentation.	Incomplete Sentences	Correctness
23.	twocases → two cases	Misspelled Words	Correctness
24.	one year → one-year	Misspelled Words	Correctness
25.	the past	Determiner Use (a/an/the/this, etc.)	Correctness
26.		Intricate Text	Clarity
27.	regeneration → rehabilitation, restoration, reconstruction, renewal	Word Choice	Engagement
28.	the current	Determiner Use (a/an/the/this, etc.)	Correctness
29.	, and	Comma Misuse within Clauses	Correctness
30.	the life-expectancy	Determiner Use (a/an/the/this, etc.)	Correctness
31.	This	Intricate Text	Clarity
32.	be done	Passive Voice Misuse	Clarity
33.	selection of → selecting	Wordy Sentences	Clarity
34.	techniques → procedures	Word Choice	Engagement

35.	The following	Determiner Use (a/an/the/this, etc.)	Correctness
36.	case,	Comma Misuse within Clauses	Correctness
37.	ef	Wrong or Missing Prepositions	Correctness
38.	which have → that have	Pronoun Use	Correctness
39.	an interdisciplinary	Determiner Use (a/an/the/this, etc.)	Correctness
40.	incisorand → incisor and	Misspelled Words	Correctness
41.	in relation to → about, to, with, concerning	Wordy Sentences	Clarity
42.	since → for	Wrong or Missing Prepositions	Correctness
43.	4 → four	Improper Formatting	Correctness
44.	4 → four	Improper Formatting	Correctness
45.	, after	Punctuation in Compound/Complex Sentences	Correctness
46.	was extracted	Passive Voice Misuse	Clarity
47.	3 → three	Improper Formatting	Correctness
48.	the patient	Determiner Use (a/an/the/this, etc.)	Correctness
49.	the labial	Determiner Use (a/an/the/this, etc.)	Correctness
50.	the maxillary	Determiner Use (a/an/the/this, etc.)	Correctness
51.	. Periodontal	Improper Formatting	Correctness
52.	A periodontal	Determiner Use (a/an/the/this, etc.)	Correctness

		etc.)	
53.	the mesial	Determiner Use (a/an/the/this, etc.)	Correctness
54.	the maxillary	Determiner Use (a/an/the/this, etc.)	Correctness
55.	the edentulous	Determiner Use (a/an/the/this, etc.)	Correctness
56.	The radiographic	Determiner Use (a/an/the/this, etc.)	Correctness
57.	periapical radiolucency	Misspelled Words	Correctness
58.		Intricate Text	Clarity
59.	a complete	Determiner Use (a/an/the/this, etc.)	Correctness
60.	using demineralized	Improper Formatting	Correctness
61.	freeze-dried → freeze-dried	Misspelled Words	Correctness
62.	root end → root-end	Misspelled Words	Correctness
63.	was planned	Passive Voice Misuse	Clarity
64.	<i>After complete evaluation of history, clinical condition, radiographic investigations, ridge augmentation using demineralized freeze dried bone allograft (DFDBA) and amnion membrane (AM) at the defective area in the maxillary alveolar ridge followed by conventional Fixed Partial Denture (FPD) to ...</i>	Hard-to-read text	Clarity
65.	were discussed	Passive Voice Misuse	Clarity
66.	administration of → administering	Wordy Sentences	Clarity

67.	given using → given using	Misspelled Words	Correctness
68.	mesial → medial	Confused Words	Correctness
69.	the mesial	Determiner Use (a/an/the/this, etc.)	Correctness
70.	The submarginal, or A submarginal	Determiner Use (a/an/the/this, etc.)	Correctness
71.	the esthetic	Determiner Use (a/an/the/this, etc.)	Correctness
72.	to prevent → of preventing	Wrong or Missing Prepositions	Correctness
73.	the PFM	Determiner Use (a/an/the/this, etc.)	Correctness
74.	<i>postoperatively; post-operatively</i>	Text Inconsistencies	Correctness
75.	<i>were made</i>	Passive Voice Misuse	Clarity
76.	full thickness → full-thickness	Misspelled Words	Correctness
77.	<i>was raised</i>	Passive Voice Misuse	Clarity
78.	. Labially	Improper Formatting	Correctness
79.	<i>was enlarged</i>	Passive Voice Misuse	Clarity
80.	the periapical	Determiner Use (a/an/the/this, etc.)	Correctness
81.	<i>was carried</i>	Passive Voice Misuse	Clarity
82.	resection,	Punctuation in Compound/Complex Sentences	Correctness
83.	<i>was done</i>	Passive Voice Misuse	Clarity
84.	. Partial	Improper Formatting	Correctness

85.	the distal	Determiner Use (a/an/the/this, etc.)	Correctness
86.	was completed	Passive Voice Misuse	Clarity
87.	was given	Passive Voice Misuse	Clarity
88.	the mesial → the mesial	Improper Formatting	Correctness
89.	, which	Punctuation in Compound/Complex Sentences	Correctness
90.	crestal	Unknown Words	Correctness
91.	the maxillary	Determiner Use (a/an/the/this, etc.)	Correctness
92.	<i>For augmentation of localized ridge defect, a crevicular incision was given on the mesial aspect of left central incisor which continued as a crestal incision over the edentulous span till the mesial aspect of maxillary right lateral incisor, splitting its mesial papilla.</i>	Hard-to-read text	Clarity
93.	were also given	Passive Voice Misuse	Clarity
94.	. Upon	Improper Formatting	Correctness
95.	full thickness → full-thickness	Misspelled Words	Correctness
96.	a large	Determiner Use (a/an/the/this, etc.)	Correctness
97.	the defect, or a defect	Determiner Use (a/an/the/this, etc.)	Correctness
98.	was made	Passive Voice Misuse	Clarity
99.	the maxillary	Determiner Use (a/an/the/this, etc.)	Correctness
100.	In addition → Also, Besides	Wordy Sentences	Clarity

101.	<i>addition; Addition</i>	Text Inconsistencies	Correctness
102.	<i>the loss, or a loss</i>	Determiner Use (a/an/the/this, etc.)	Correctness
103.	crestal → <i>crest, crystal</i>	Misspelled Words	Correctness
104.	<i>, and</i>	Punctuation in Compound/Complex Sentences	Correctness
105.	buccalaspect → <i>buccal aspect</i>	Misspelled Words	Correctness
106.	<i>were performed</i>	Passive Voice Misuse	Clarity
107.	bur under → <i>bur under</i>	Improper Formatting	Correctness
108.		Intricate Text	Clarity
109.	<i>was directly compacted</i>	Passive Voice Misuse	Clarity
110.	<i>was placed</i>	Passive Voice Misuse	Clarity
111.	<i>was approximated</i>	Passive Voice Misuse	Clarity
112.	<i>A periodontal</i>	Determiner Use (a/an/the/this, etc.)	Correctness
113.	<i>was applied</i>	Passive Voice Misuse	Clarity
114.	on → <i>to</i>	Wrong or Missing Prepositions	Correctness
115.	<i>AM was extended >3mm beyond defect borders. The mucoperiosteal flap was approximated with interrupted sutures. Periodontal pack was applied on the surgical area.</i>	Monotonous Sentences	Engagement
116.	<i>The patient</i>	Determiner Use (a/an/the/this, etc.)	Correctness
117.	<i>was reexamined</i>	Passive Voice Misuse	Clarity

118.	, and	Punctuation in Compound/Complex Sentences	Correctness
119.	post surgical → post-surgical	Misspelled Words	Correctness
120.	were revealed	Passive Voice Misuse	Clarity
121.	were removed	Passive Voice Misuse	Clarity
122.	the first	Determiner Use (a/an/the/this, etc.)	Correctness
123.	week,	Comma Misuse within Clauses	Correctness
124.	an absence	Determiner Use (a/an/the/this, etc.)	Correctness
125.	an esthetic → anesthetic	Confused Words	Correctness
126.	case,	Comma Misuse within Clauses	Correctness
127.	complex → complicated	Word Choice	Engagement
128.	the treatment	Determiner Use (a/an/the/this, etc.)	Correctness
129.	treatment of → treating	Wordy Sentences	Clarity
130.	infrabonydefect	Unknown Words	Correctness
131.	. This	Improper Formatting	Correctness
132.	This	Intricate Text	Clarity
133.	been used	Passive Voice Misuse	Clarity
134.	initial → first	Word Choice	Engagement
135.	the back	Determiner Use (a/an/the/this, etc.)	Correctness

136.	the early	Determiner Use (a/an/the/this, etc.)	Correctness
137.	as well	Wordy Sentences	Clarity
138.	recent development	Misspelled Words	Correctness
139.	a placental, or the placental	Determiner Use (a/an/the/this, etc.)	Correctness
140.	AMs → AMS	Misspelled Words	Correctness
141.	a variety of → various	Wordy Sentences	Clarity
142.	woundhealing → wound healing, wound-healing	Misspelled Words	Correctness
143.	extremely thin → fragile, skinny	Word Choice	Engagement
144.	self-adhering → self-adhering	Misspelled Words	Correctness
145.		Intricate Text	Clarity
146.	the bone, or a bone	Determiner Use (a/an/the/this, etc.)	Correctness
147.	result → results	Incorrect Noun Number	Correctness
148.	<i>DFDBA has the potential for osteoinduction with more expression of bone morphogenetic protein (BMP)& has shown excellent result in regenerative therapy.</i>	Hard-to-read text	Clarity
149.	Post-operative → Postoperative	Confused Words	Correctness
150.	1 → one	Improper Formatting	Correctness
151.	completely	Wordy Sentences	Clarity
152.	a reduction	Determiner Use (a/an/the/this, etc.)	Correctness

		etc.)	
153.	the periapical → the periapical	Improper Formatting	Correctness
154.	of repair → of repair	Improper Formatting	Correctness
155.	<i>The radiographs with maxillary left lateral incisor also revealed reduction in radiolucency in the periapical area, suggestive of repair in that region.</i>	Hard-to-read text	Clarity
156.	root end → root-end	Misspelled Words	Correctness
157.	by virtue of → by, under	Wordy Sentences	Clarity
158.	, and	Comma Misuse within Clauses	Correctness
159.	procedure → procedures	Incorrect Noun Number	Correctness
160.	different → distinct, various	Word Choice	Engagement
161.	a remarkable, or the remarkable	Determiner Use (a/an/the/this, etc.)	Correctness
162.	result → results	Incorrect Noun Number	Correctness
163.	the past	Determiner Use (a/an/the/this, etc.)	Correctness
164.	7 → seven	Improper Formatting	Correctness
165.	since → for	Wrong or Missing Prepositions	Correctness
166.	in relation to → about, to, with, concerning	Wordy Sentences	Clarity
167.	the maxillary	Determiner Use (a/an/the/this, etc.)	Correctness
168.	, which	Punctuation in Compound/Complex Sentences	Correctness

169.	The patient	Determiner Use (a/an/the/this, etc.)	Correctness
170.	as well as → and	Wordy Sentences	Clarity
171.	with respect to → concerning, for, to	Wordy Sentences	Clarity
172.	incisorssince	Unknown Words	Correctness
173.	the scar	Determiner Use (a/an/the/this, etc.)	Correctness
174.	, causing	Punctuation in Compound/Complex Sentences	Correctness
175.	, and	Comma Misuse within Clauses	Correctness
176.	in relation to → about, to, with, concerning	Wordy Sentences	Clarity
177.	. Patient	Improper Formatting	Correctness
178.	The patient	Determiner Use (a/an/the/this, etc.)	Correctness
179.	a history	Determiner Use (a/an/the/this, etc.)	Correctness
180.		Intricate Text	Clarity
181.	the presence of	Wordy Sentences	Clarity
182.	, periapical	Improper Formatting	Correctness
183.	lesion associated	Misspelled Words	Correctness
184.	incisorusually → incisor usually	Misspelled Words	Correctness
185.	were → was	Faulty Subject-Verb Agreement	Correctness
186.		Intricate Text	Clarity

187.	incisor observed	Misspelled Words	Correctness
188.	were → was	Faulty Subject-Verb Agreement	Correctness
189.	the presence of	Wordy Sentences	Clarity
190.	an unilocular → a unilocular	Determiner Use (a/an/the/this, etc.)	Correctness
191.	well defined → well-defined	Misspelled Words	Correctness
192.	in relation to → about, to, with, concerning	Wordy Sentences	Clarity
193.	Cone beam → Cone-beam	Misspelled Words	Correctness
194.	was performed	Passive Voice Misuse	Clarity
195.	in relation to → about, to, with, concerning	Wordy Sentences	Clarity
196.	maxillary left → left maxillary	Misplaced Words or Phrases	Correctness
197.	anteriore → anterior	Misspelled Words	Correctness
198.	three dimension → three-dimension	Misspelled Words	Correctness
199.	as well as → and	Wordy Sentences	Clarity
200.	a palatal	Determiner Use (a/an/the/this, etc.)	Correctness
201.	canine.	Closing Punctuation	Correctness
202.	the diagnosis	Determiner Use (a/an/the/this, etc.)	Correctness
203.	the radicular, or a radicular	Determiner Use (a/an/the/this, etc.)	Correctness
204.	caninewas → canines, canine was	Misspelled Words	Correctness

205.		Intricate Text	Clarity
206.	tomaxillary → to maxillary	Misspelled Words	Correctness
207.	The surgical	Determiner Use (a/an/the/this, etc.)	Correctness
208.	was planned	Passive Voice Misuse	Clarity
209.	was planned	Passive Voice Misuse	Clarity
210.	planned → designed	Word Choice	Engagement
211.	, and	Punctuation in Compound/Complex Sentences	Correctness
212.	, which	Punctuation in Compound/Complex Sentences	Correctness
213.	tomaxillary → to maxillary, maxillary	Misspelled Words	Correctness
214.		Intricate Text	Clarity
215.	in relation to → about, to, with, concerning	Wordy Sentences	Clarity
216.	maxillary left → left maxillary	Misplaced Words or Phrases	Correctness
217.	incisors → teeth	Word Choice	Engagement
218.	build up → build-up	Misspelled Words	Correctness
219.	full coverage → full-coverage	Misspelled Words	Correctness
220.	surgery,	Comma Misuse within Clauses	Correctness
221.	partial-thickness	Misspelled Words	Correctness
222.	The sinus	Determiner Use (a/an/the/this, etc.)	Correctness
223.			

	, and	Comma Misuse within Clauses	Correctness
224.	foamcubes → foam cubes	Misspelled Words	Correctness
225.	the periapical	Determiner Use (a/an/the/this, etc.)	Correctness
226.	was executed	Passive Voice Misuse	Clarity
227.	the complete	Determiner Use (a/an/the/this, etc.)	Correctness
228.	the palatal	Determiner Use (a/an/the/this, etc.)	Correctness
229.	was adopted	Passive Voice Misuse	Clarity
230.	, and	Punctuation in Compound/Complex Sentences	Correctness
231.	and a → . A	Hard-to-read text	Clarity
232.	full thickness → full-thickness	Misspelled Words	Correctness
233.	was raised	Passive Voice Misuse	Clarity
234.	the mesial	Determiner Use (a/an/the/this, etc.)	Correctness
235.	large → sizeable	Word Choice	Engagement
236.	was revealed	Passive Voice Misuse	Clarity
237.	maxillary left → left maxillary	Misplaced Words or Phrases	Correctness
238.	incisors → teeth	Word Choice	Engagement
239.	was performed	Passive Voice Misuse	Clarity
240.	incisors → teeth	Word Choice	Engagement
241.	root end → root-end	Misspelled Words	Correctness

242.	<i>was placed</i>	Passive Voice Misuse	Clarity
243.	<i>was filled</i>	Passive Voice Misuse	Clarity
244.	, which	Punctuation in Compound/Complex Sentences	Correctness
245.	<i>was sandwiched</i>	Passive Voice Misuse	Clarity
246.	amnion → amnions	Incorrect Noun Number	Correctness
247.	efsize → of size, size, outside	Misspelled Words	Correctness
248.	<i>postoperative; post-operative</i>	Text Inconsistencies	Correctness
249.	<i>was observed</i>	Passive Voice Misuse	Clarity
250.	the radicular, or a radicular	Determiner Use (a/an/the/this, etc.)	Correctness
251.	A sinus	Determiner Use (a/an/the/this, etc.)	Correctness
252.	<i>is defined</i>	Passive Voice Misuse	Clarity
253.	tract → track	Confused Words	Correctness
254.	tract → stretch	Word Choice	Engagement
255.	obvious → evident, apparent	Word Choice	Engagement
256.		Intricate Text	Clarity
257.	Generally,	Comma Misuse within Clauses	Correctness
258.	tracts heal → tracts heal	Improper Formatting	Correctness
259.	case,	Comma Misuse within Clauses	Correctness
260.	proper → appropriate	Word Choice	Engagement
261.	<i>Generally odontogenic sinus tracts</i>	Hard-to-read text	Clarity

heal with proper endodontic treatment, but in this case surgical intervention was required due to persistent sinus tract even after proper endodontic treatment.

262.	. Radicular	Improper Formatting	Correctness
263.	. During	Improper Formatting	Correctness
264.	by the use of → using	Wordy Sentences	Clarity
265.	the appropriate	Determiner Use (a/an/the/this, etc.)	Correctness
266.		Passive Voice Misuse	Clarity
267.	. Use	Improper Formatting	Correctness
268.	The use	Determiner Use (a/an/the/this, etc.)	Correctness
269.	a distinctive	Determiner Use (a/an/the/this, etc.)	Correctness
270.	cystmay → cyst may	Misspelled Words	Correctness
271.	have → has	Faulty Subject-Verb Agreement	Correctness
272.		Intricate Text	Clarity
273.	, and	Punctuation in Compound/Complex Sentences	Correctness
274.	along with → and	Wordy Sentences	Clarity
275.	, and	Comma Misuse within Clauses	Correctness
276.	a strict	Determiner Use (a/an/the/this, etc.)	Correctness
277.	area,	Punctuation in Compound/Complex Sentences	Correctness

278.	, and	Comma Misuse within Clauses	Correctness
279.	, now → ; now, , and now, . Now	Punctuation in Compound/Complex Sentences	Correctness
280.	ago,	Punctuation in Compound/Complex Sentences	Correctness
281.	resective	Unknown Words	Correctness
282.	cleansibility → cleanability	Misspelled Words	Correctness
283.	of the → of the	Improper Formatting	Correctness
284.		Intricate Text	Clarity
285.		Intricate Text	Clarity
286.	therapy → treatment	Word Choice	Engagement
287.	osseous → bony	Word Choice	Clarity
288.		Intricate Text	Clarity
289.	. To	Improper Formatting	Correctness
290.	, and	Comma Misuse within Clauses	Correctness
291.	on,	Punctuation in Compound/Complex Sentences	Correctness
292.	to term them advanced periodontal surgeries tentatively	Inappropriate Colloquialisms	Delivery
293.	<i>Combination of 2 or more different surgical procedures, in which conventional periodontal surgery would have produced, compromised results.</i>	Incomplete Sentences	Correctness
294.	<i>Modification in the incisions, suturing techniques as per the case.</i>	Incomplete Sentences	Correctness

295.	a novel	Determiner Use (a/an/the/this, etc.)	Correctness
296.	of autogenous → of autogenous	Improper Formatting	Correctness
297.	be used	Passive Voice Misuse	Clarity
298.	<i>Procedures in which novel combination of autogenous and non-autogenous material can be used at the time of surgery.</i>	Incomplete Sentences	Correctness
299.	<i>Regeneration of lost hard and soft tissue.</i>	Incomplete Sentences	Correctness
300.	<i>Interdisciplinary approach for exceptional treatment outcome.</i>	Incomplete Sentences	Correctness
301.	been used	Passive Voice Misuse	Clarity
302.	, which	Punctuation in Compound/Complex Sentences	Correctness
303.	be designated	Passive Voice Misuse	Clarity
304.	wide → broad, full	Word Choice	Engagement
305.	be considered	Passive Voice Misuse	Clarity
306.	the periodontal	Determiner Use (a/an/the/this, etc.)	Correctness
307.	needs → need	Faulty Subject-Verb Agreement	Correctness
308.	procedure → procedures	Incorrect Noun Number	Correctness
309.	demand → need, request, market	Word Choice	Engagement
310.	alongwith → along with	Misspelled Words	Correctness
311.	has → have	Faulty Subject-Verb Agreement	Correctness

312.	, and	Comma Misuse within Clauses	Correctness
313.	dentogingival	Unknown Words	Correctness
314.	a unique	Determiner Use (a/an/the/this, etc.)	Correctness
315.	be achieved	Passive Voice Misuse	Clarity
316.	onlay	Unknown Words	Correctness
317.	Toscano,	Punctuation in Compound/Complex Sentences	Correctness
318.	intrabony	Unknown Words	Correctness
319.	toinactive → to inactive, inactive	Misspelled Words	Correctness
320.	boneinductive → bone inductive	Misspelled Words	Correctness
321.	Schwartz Z, Somers A, Mellonig JT, et al. Addition of human recombinant bone morphogenetic protein-2 toinactive commercial human demineralized freeze-dried bone allograft makes an effective composite boneinductive implant material.	Hard-to-read text	Clarity
322.	Fehrenbach → Fehrenbach	Misspelled Words	Correctness
323.	the recession, or a recession	Determiner Use (a/an/the/this, etc.)	Correctness
324.	the mesial	Determiner Use (a/an/the/this, etc.)	Correctness
325.	the edentulous	Determiner Use (a/an/the/this, etc.)	Correctness
326.	resection,	Punctuation in Compound/Complex Sentences	Correctness
327.	was done	Passive Voice Misuse	Clarity

328.	<i>Fig7: Trapezoidal flap raised for adjacent ridge defect.</i>	Incomplete Sentences	Correctness
329.	done → is done	Incorrect Verb Forms	Correctness
330.	<i>is sandwiched</i>	Passive Voice Misuse	Clarity
331.	the amnion	Determiner Use (a/an/the/this, etc.)	Correctness
332.	1-year → 1-year	Misspelled Words	Correctness
333.	post operative → postoperative	Confused Words	Correctness
334.	Pre-operative → Preoperative	Confused Words	Correctness
335.	Gutta percha → Gutta-percha	Misspelled Words	Correctness
336.	Pre-operative → Preoperative	Confused Words	Correctness
337.	the root	Determiner Use (a/an/the/this, etc.)	Correctness
338.	the nasal	Determiner Use (a/an/the/this, etc.)	Correctness
339.	<i>is seen</i>	Passive Voice Misuse	Clarity
340.	a palatal	Determiner Use (a/an/the/this, etc.)	Correctness
341.	the loss	Determiner Use (a/an/the/this, etc.)	Correctness
342.	corticalplate → cortical plate	Misspelled Words	Correctness
343.	invoving → involving	Misspelled Words	Correctness
344.	above mentioned → above-mentioned	Misspelled Words	Correctness
345.			

	Partial-thickness	Misspelled Words	Correctness
346.	<i>was raised</i>	Passive Voice Misuse	Clarity
347.	Raw → Hard	Word Choice	Engagement
348.	The raw	Determiner Use (a/an/the/this, etc.)	Correctness
349.	<i>was filled</i>	Passive Voice Misuse	Clarity
350.	gelfoam → gel foam	Misspelled Words	Correctness
351.	incision → incisions	Incorrect Noun Number	Correctness
352.	Full-thickness → Full-thickness	Misspelled Words	Correctness
353.	<i>was raised</i>	Passive Voice Misuse	Clarity
354.	the defect, or a defect	Determiner Use (a/an/the/this, etc.)	Correctness
355.	. Apeciectomy	Improper Formatting	Correctness
356.	<i>was performed</i>	Passive Voice Misuse	Clarity
357.	The defect	Determiner Use (a/an/the/this, etc.)	Correctness
358.	<i>was filled</i>	Passive Voice Misuse	Clarity
359.	one-year → one-year	Misspelled Words	Correctness
360.	<i>Advanced periodontal surgeries-report of 2 cases with one year follow-up.</i>	Advanced periodontal surgeries-report of 2 cases with one ... https://www.journalcra.com/article/advanced-periodontal-surgeries-report-2-cases-one-year-follow	Originality
361.	<i>exploit different materials, and interdisciplinary approach for favorable treatment</i>	Advanced periodontal surgeries-report of 2 cases with one ...	Originality

		https://www.journalcra.com/article/advanced-periodontal-surgeries-report-2-cases-one-year-follow	
362.	<i>This case report illustrating 2 cases with one year follow-up period which had been treated by utilizing principles of advanced periodontal surgeries. First case describes interdisciplinary approach for management of adjacent</i>	Advanced periodontal surgeries-report of 2 cases with one ... https://www.journalcra.com/article/advanced-periodontal-surgeries-report-2-cases-one-year-follow	Originality
363.	<i>Class III ridge defect and periapical cyst. Second case is management of palatal perforation associated with large</i>	Advanced periodontal surgeries-report of 2 cases with one ... https://www.journalcra.com/article/advanced-periodontal-surgeries-report-2-cases-one-year-follow	Originality
364.	<i>Periodontal surgery is an essential part of modern</i>	Incisions and Tissue Management in Periodontal Surgery https://perio.quintessenz.de/111borchard.pdf	Originality
365.	<i>The ultimate goal of periodontal surgery is to</i>	Periodontal Surgery Fort Lauderdale FL | Dr. Todd Sawisch ... https://www.oralfacialcosmeticsurgery.com/procedures/periodontal-surgery/	Originality
366.	<i>This can be done by selection of appropriate</i>	AgPest » Creeping yellow cress http://agpest.co.nz/?pesttypes=creeping-yellow-cress	Originality
367.	<i>The labio-palatal contours and height of the alveolar ridge were now acceptable to place an esthetic FPD. The</i>	An alveolar ridge augmentation using connective tissue ... https://www.ipsonline.in/Files/2007/AprJun/CR4.pdf	Originality
368.	<i>A 27-year-old male patient reported to the department of</i>	Cureus | Bilateral Dentigerous Cyst in Impacted Mandibular ... https://www.cureus.com/articles/15963-bilateral-dentigerous-cyst-in-impacted-mandibular-third-molars-a-case-report	Originality

369.	<i>Sinus tract is defined as a channel leading from an enclosed area of inflammation to an epithelial surface. The</i>	Non surgical management of cutaneous sinus tract of ... https://academicjournals.org/journal/JDOH/article-full-text-pdf/027ADBB45049	Originality
370.	<i>They are commonly found at the apices of involved teeth and sometimes lateral to accessory root canals.</i>	Implants 02/2015 - OEMUS MEDIA AG https://oemus.com/issue/implants-022015/	Originality
371.	<i>periodontal surgical procedures were typically resective in nature. The goals of these procedures were to debride the roots and increase the</i>	Cosmetic aspect in periodontics - Open access https://www.longdom.org/proceedings/cosmetic-aspect-in-periodontics-24567.html	Originality
372.	<i>of the teeth by reducing pocket depths and modifying furcation defects, often via root removal. The value of this form of therapy on the overall retention of teeth is high, and it remains valid as a treatment modality</i>	Cosmetic aspect in periodontics - Open access https://www.longdom.org/proceedings/cosmetic-aspect-in-periodontics-24567.html	Originality
373.	<i>The unfortunate consequences of this mode of therapy include increased root exposure and decreased papillary height due to apical repositioning of the osseous crest and free gingival margin.</i>	Cosmetic aspect in periodontics - Open access https://www.longdom.org/proceedings/cosmetic-aspect-in-periodontics-24567.html	Originality
374.	<i>Amnion–Chorion allograft barrier used for guided tissue regeneration treatment of periodontal intrabony defects: a retrospective observational report.</i>	Amnion–Chorion Allograft Barrier Used for Guided Tissue ... https://aap.onlinelibrary.wiley.com/doi/abs/10.1902/cap.2012.110110	Originality
375.	<i>Kim JS, Kim JC, Na BK, Jeong JM, Song CY. Amniotic membrane patching promotes healing and inhibits proteinase activity on wound healing following acute corneal alkali burn. Exp Eye Res 2000;70:</i>	New Amniotic Membrane Based Biocomposite for Future Application in Reconstructive Urology	Originality

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1	Misuse of quantifiers	
19	Comma misuse within clauses	
1	Incorrect verb forms	
3	Incomplete sentences	
2	Unknown words	
2	Closing punctuation	
2	Confused words	
6	Faulty subject-verb agreement	
4	Improper formatting	
1	Misplaced words or phrases	
1	Mixed dialects of english	
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13

Evaluation of Moyer's¹ and Tanaka-Johnston Mixed Dentition Space Analysis in Population of Marathwada Region Between Age Group of 13-16 Years

Abstract:

Introduction: During mixed² dentition period, to estimate the size of unerupted permanent cuspid and bicuspid is one of the significant aspects for intervention of early malocclusion.³ Most⁴ commonly used prediction methods based on data from a sample of Northern European descent children are Moyer's¹ and Tanaka-Johnston⁶ analysis. Aim: To evaluate the applicability of the Moyer's¹ and Tanaka-Johnston mixed dentition analysis in the regional population of Marathwada between the age group of 13-16 years.⁸ Materials and Method: The sample for the study consisted of 190 children (95 girls and 95 boys) within the age group of 13-16 years.⁹ By using a digital vernier caliper, with accuracy of 0.05mm, actual mesio-distal¹¹ dimensions of four permanent mandibular incisors, upper and lower cuspid and bicuspid of right and left sides were measured.¹² These all measurements were then averaged and compared with those mixed dentition analysis.¹³ Statistical analysis: Data was analyzed using SPSS software. Comparison of mean and standard deviation between the two groups was carried out by using unpaired't' test.¹⁴ ANOVA F test value and Tukey's¹⁵ post hoc test were used for pairwise comparison.¹⁶ Result: In both, males and females the predicted values obtained, was at Moyer's 75% level underestimated actual mesio-distal widths of cuspid and bicuspid.¹⁷¹⁸¹⁹²⁰²¹

Tanaka – Johnston equation overestimated actual mesio-distal widths of canine and premolars in males and females. Conclusion: Result of current study showed that the Moyer's and Tanaka-Johnston analysis were not suitable for Marathwada population, further studies are required with more number of samples for the study to be valid in a wider range.

Keywords: Mixed dentition analysis, Moyer's and Tanaka-Johnston Mixed Dentition Space Analysis

Introduction

Pedodontist has a great opportunity to come across patients in their developing stages of life. One of the most important problems faced during development is malocclusion.¹ An accurate space assessment in mixed dentition period is an early intervention of this problem.² During this mixed dentition period to provide a precise diagnosis of any developing malocclusions is crucial.

An accurate analysis is necessary for proper diagnosis and treatment planning.³ Space analysis in mixed dentition can be achieved through three broad approaches that include radiographic, non-radiographic methods and a combination of both. Radiographic methods need measurements of undistorted long-cone radiographic images of erupted and unerupted teeth³, such complex methods might discourage their routine use by dental practitioners. In order to analyze a case comprehensively, predictive methods should be accurate, safe, simple and rapid and should not require any special equipment.

The Moyer's¹ probability tables⁴⁷ were established at the University of Michigan based on odontometric⁴⁸ data of American white subjects of Northwestern European descent.⁴ To predict the width of unerupted permanent cuspid and bicuspid for both jaws, Tanaka-Johnston in 1974 re-evaluated Moyer'¹ analysis and established a simple approximation equation by using the sum of mesio-distal⁴⁹ widths of lower permanent incisor to develop regression equations for predicting the sizes of the unerupted cuspid and bicuspid.⁵

Several studies on different populations have found sexual, racial, as well as⁵⁰ ethnic variations in tooth size. It has been already proved⁵¹ that different racial and population groups display diversified mixed dentition analysis. 5,6,7,8,9 To date, no studies⁵² in the literature had cited regarding⁵³ the study⁵⁴ of mixed dentition analysis in regional⁵⁵ population of the Marathwada. The purpose of the present study was to evaluate the applicability⁷ of Moyer's⁵⁶ and Tanaka-Johnston⁵⁷ mixed dentition space analysis in the regional population of Marathwada between 13-16 years of males and females.

Materials and Methods

The study was carried out after after⁵⁸ gaining approval from institutional ethical⁵⁹ committee, MIDSR/STU/PG/560/957/2018 and informed consent⁶⁰, in the Department of Pediatric and Preventive Dentistry.⁶² The sample for the study was consisting⁶³ of 190 children (95 girls and 95 boys) within the age group of 13-16 years.⁶⁴

Inclusion and exclusion criteria:

Inclusion criteria:

All Permanent teeth erupted except the third molar.

Patient⁶⁵ free from any systemic diseases or serious⁶⁶ health problem.⁶⁷

Both the patient and their parent should be a domicile of Marathwada⁶⁸ region.

The subject should be between 13 – 16 years of age.

The subject gives informed consent.

Exclusion criteria:

Teeth with clinical evidence of hypoplasia or hypocalcification ^{69 70} .

Teeth with proximal caries, proximal wear restoration or fractures. ⁷¹

The subject with a history of orthodontic therapy. ⁷²

Presence of dental anomalies.

The presence of crossbite relationship, reverse curve of spee, ⁷³ attrition or ⁷⁴ other abnormality.

Methodology:

For each sample, alginate impressions were made ⁷⁵ using standard procedures and material. 2% glutaraldehyde was used ⁷⁶ for disinfecting all impressions ⁷⁷ and later washed in running water. Impressions were poured immediately with a hard dental stone and ⁷⁸ dental casts where prepared. They were neither soaped nor waxed.³ The teeth dimensions were measured by a digital caliper with accuracy ⁷⁹ of 0.05 mm. The major space among the contact points of the four mandibular incisors and the maxillary and mandibular cuspid and bicuspid were measured as described by Hunter and Priest. ^{82,83}⁶

Further ⁸⁴ the values obtained for the right and left segments were averaged for each value of mandibular incisors, ⁸⁵ so that there was one value for maxillary canine and premolars and one value for mandibular cuspid and bicuspid. All these measurements were noted on excel spread sheets. ⁸⁶ ⁸⁷

Statistical analysis

Obtained data was entered ⁸⁸ in the MS-excel sheet; and analyzed by SPSS software. The quantitative data ⁹⁰ was expressed ⁹¹ as mean and standard deviation. Descriptive statistics: Including the mean, ⁹³ standard deviation, ⁹⁴ minimum and maximum values, ⁹⁵ range ⁹⁶ and standard error ⁹⁷ were calculated.

Comparison of mean and standard deviation between the two groups was carried out by using unpaired 't' test. ANOVA F test and Turkey's post hoc test were used to obtain a pairwise comparison.

Significance level was placed as $p < 0.05$ – (Significant) & $p < 0.001$ – (Highly Significant).

Results

Table 1: Comparison of LI, UCPM, LCPM between males & females

MALES MEAN (SD)

FEMALES MEAN (SD)

MEAN

DIFFERENCE

P value, Significance

LI

22.01 (1.17)

21.59 (1.35)

0.58

$p = 0.025^*$

UCPM

21.81 (1.15)

21.56 (1.21)

0.25

$p = 0.154$

LCPM

21.35 (1.15)

20.89 (1.14)

0.54

p =0.007*

¹⁰⁴Graph I: Comparison of LI, UCPM, LCPM between males & females

The ¹⁰⁵mesio-distal ¹⁰⁶widths of ^{107,108}lower incisor, when compared between males and females ¹⁰⁹subject were statistically significant (p=0.025) having ¹¹⁰mean ¹¹¹difference of 0.58. The ¹¹²mesio-distal ¹¹³widths of mandibular cuspid and bicuspid of the males were significantly ¹¹⁴larger ¹¹⁵than the females (p=0.007). However, in the maxillary arch, the sum of ¹¹⁶mesio-distal ¹¹⁷widths of canines & premolars between males & females showed differences which was statistically insignificant (p=0.154) shown in table 1 ¹¹⁸and in ¹¹⁹graph I. Combined ¹²⁰mesio-distal ¹²¹width of cuspid and bicuspid of the males ¹²²subject were significantly ¹²³larger ¹²⁴than the females.

Table 2: ¹¹⁹Comparison of actual ¹²⁰mesio-distal ¹²¹widths of permanent cuspid and bicuspid with predicted ¹²²Moyer's ¹²³predicted value at 75% level for males.

Males

Actual

Mean (SD)

¹Moyer's at

75% level

Mean (SD)

Unpaired ¹¹'t' test value

¹²¹p value,

Significance

¹²²UCPM

21.81 (1.15)

21.38 (0.61)

t = 3.135

p = 0.002*

LCPM

21.35 (1.15)

21.36 (0.61)

t = - 0.316

p = 0.752

p > 0.05 – no significant *p < 0.05 – significant **p < 0.001 – highly significant

Graph II: Comparison of actual mesio-distal¹²³ width of permanent canine premolars with predicted Moyer's¹ predicted value at 75% level for males. While comparing the actual upper canine premolars widths of males with predicted values obtained with the Moyer's¹ at 75% level were¹²⁴ statistically significant (p=0.002), whereas in mandibular arch actual widths with Moyer's¹ predictable tables showed significant changes but not statistically significant (p=0.752), as shown in table no 2¹²⁵ and in graph II¹²⁶. Predicted values obtained at Moyer's¹ 75% level underestimated actual mesio-distal¹²⁷ widths of cuspid and bicuspid in males.

Table 3: Comparison of actual¹²⁸ mesio-distal¹²⁹ widths of permanent canine premolars with predicted Moyer's¹ at 75% level in females.

Females

Actual

Mean (SD)

Moyer's¹ at 75% level

Mean (SD)

Unpaired 't'¹¹ test value

p value,¹³⁰

Significance

UCPM¹³¹

21.56 (1.21)

20.93 (0.42)

t = 4.746

p <0.001**

LCPM

20.89 (1.14)

20.76 (0.63)

t = 0.996

p =0.320

p>0.05 – no significant *p<0.05 – significant **p<0.001 –highly significant

Graph III: Comparison of actual mesio-distal¹³² width of permanent canine premolars with Moyer's¹ at 75% level method in females.

While comparing the actual upper canine premolars widths of the females with predicted values obtained with the Moyer's¹ 75% level were¹³³ statistically significant (p=0.001), whereas in mandibular arch actual lower cuspid and bicuspid widths with predicted Moyer's¹ 75% level showed significant changes but not statistically significant (p=0.320) as shown in table no 3¹³⁴ and graph no III. Predicted values obtained at Moyer's¹ 75% level underestimated actual mesio-distal¹³⁵ widths of cuspid and bicuspid in females.

Table 4: Comparison of actual mesio-distal¹³⁶ width of permanent canine and premolars with predicted Tanka - Johnston analysis method combined for males and females.

M+F

Actual value

(in mm)

Tanaka-

Johnston

(in mm)

Mean

Difference

p value,¹³⁷

Significance

UCPM¹³⁸

21.68 (1.19)

21.82 (0.65)

0.14

p = 0.158

LCPM

21.12 (1.17)

21.4 (0.65)

0.28

p = 0.005*

p < 0.05 – not significant *p < 0.05 – significant difference

Graph IV: Comparison of actual mesio-distal¹³⁹ widths of permanent cuspid and bicuspid with predicted Tanka-Johnston analysis method combined for males and females.

Descriptive statistic¹⁴⁰ in Table 4 and graph IV¹⁴¹ showed that combined widths of Tanaka - Johnston LCPM having larger values compared to actual combined mesio-distal¹⁴² widths of LCPM, which were statistically significant (p=0.005)

having a mean difference of 0.28. Whereas in maxillary arch predicted values compared with actual widths¹⁴³ were significant¹⁴⁴ but not statistically significant (p=0.158). Tanaka – Johnston equation overestimated actual mesio-distal¹⁴⁵ widths of canine and premolars in males and females.

Discussion

Determination of tooth size-arch length relationship during mixed dentition is an important¹⁴⁶ aspect of diagnosis. The prime cause for developing malocclusion is arch length deficiency, therefore predicting the sizes of unerupted cuspids and bicuspids is important¹⁴⁷ in evaluating the amount of space available in the arch for the succeeding permanent teeth and thereby making necessary occlusal adjustments.

All mixed dentition analysis fall into three strategies: Radiographic, Non-Radiographic¹⁴⁸ and a combination of both. The radiographic method to find out¹⁴⁹ the sizes of unerupted cuspids and premolars has certain disadvantages like underexposure/overexposure/distortions¹⁵⁰ etc of x-rays. Moyer's,¹ Tanaka - Johnston,¹⁵¹ Ballard¹⁵¹ and Wylie¹⁵¹ have formulated methods for predicting the sizes of unerupted cuspid and bicuspid using the mesio-distal¹⁵² widths of erupted mandibular permanent incisors¹⁵³^{154,155}

Moyer's¹ predicted tables at 75% level is worldwide¹⁵⁶ used method to assess the mesio-distal¹⁵⁷ width of unerupted canine and premolars.⁴ However, Tanaka – Johnston produced simplified regression equations for predicting the sizes of unerupted cuspid and bicuspid. They established that by taking the half mesio-distal¹⁵⁸ width of mandibular incisors and adding 10.5mm for mandibular teeth and 11.0 mm for maxillary teeth.⁵ This^{159,160} prediction method is perhaps one of the quickest and easiest to perform.

All of the prediction methods have one unit in common¹⁶¹ that is,¹⁶² the information¹⁶³ about the size of some individual erupted teeth. For a clinician¹⁶⁴ it is difficult to¹⁶⁵

make an adequate diagnosis and treatment plan, without knowing about the size of individual teeth and groups of teeth. The sum of the mesio-distal widths of the four mandibular permanent incisors are the best predictors for unerupted cuspid and bicuspid as indicated by multiple regression analyses.^{8, 4, 9} The permanent mandibular incisors were chosen for prediction because they erupt into the mouth early in mixed dentition and can be easily measured directly and accurately in cases of most space problems.

Recently, numerous studies have been carried out to evaluate the applicability of these prediction methods in non-Caucasian population groups because it has been established in the literature that ethnic differences exist in tooth sizes.^{10, 11} No previous studies have been conducted on the Marathwada region and because of their distinct ethnicity and uniqueness; a study to evaluate the applicability of these prediction methods becomes relevant to this population.

In this study, when the combined mesio-distal diameters of the lower incisors, in mandibular arch that is lower cuspid and bicuspid (LCPM) were compared statistical analysis proved that it was significantly larger in males (LI, $p = 0.025$; LCPM, $p = 0.007$) than females. But in the maxillary arch, though the combined widths of cuspid and bicuspid of males were greater than females, it was statistically insignificant, ($p = 0.154$) as shown in table 1. Significant sexual dimorphism has also been noted in other studies.^{14, 15, 16} Diagne et al (2003)¹⁷ in their study in black Senegalese children revealed that the mesio-distal diameters of the mandibular incisors, maxillary and mandibular canine and premolar segments were greater in men than in females. Similar results were found in the study by D Paula et al (1995)¹⁸, Jaroontham and Godfrey (2000).¹⁹

In the maxillary arch, Moyer's¹ prediction (75%) underestimated the actual values by 0.61+/-1.15mm in male subjects and¹⁹⁰ in the female group the¹⁹¹ underestimation was by 0.42+/-1.21 mm which was considered¹⁹³ as statistically highly significant. Tanaka-Johnson prediction overestimated the combined mesio-distal¹⁹⁴ widths of unerupted permanent cuspid and bicuspid by 1.15 +/-0.66 mm in male subjects and 1.21+/-0.64 mm for the female group. In the mandibular arch, Moyer's¹ (75%) also underestimated the actual values in males (0.61+/-1.12 mm) and females (0.63+/-1.14 mm). Tanaka-Johnson method overestimated the measured values of the combined mesio-distal¹⁹⁵ widths for males (1.15 +/-0.66 mm) and females (1.14+/-0.70 mm).¹⁹⁶

The result of present study were¹⁹⁷ reliable with other studies which were carried¹⁹⁸ out to population other than Caucasian American children.¹⁹⁹ According to Al Khadra (1993)²⁰⁰ 21, Moyer's¹ chart at the 75th percentile and Tanaka –Johnson equations overestimated the size of buccal segments in a Saudi Arab population.²⁰¹ Diagne et al²⁰² (2003) 17 obtained similar results on Senegalese²⁰³ population^{204,205} where the Tanaka-Johnson equations overestimated²⁰⁶ the actual values.

The present study showed that actual value for lower cuspid and bicuspid were²⁰⁷ coincident with the Moyer's 75% probability level in male, when the mean values of lower incisors and lower cuspid and bicuspid were considered^{208 209}. In contrast, Rani and Goel (1989)²¹⁰ 24 analysed that Moyer's²¹¹ prediction tables for¹ south Indian population found to be²¹² more applicable at the 35% level, instead²¹³ of 75%.

Merz et al²¹⁴ 25 also showed the mean mesio-distal diameter of the black sample's¹ lower canines, bicuspids and²¹⁵ first molars was significantly larger²¹⁶ than that of the white sample,²¹⁷ but no significant differences were demonstrated²¹⁸ in²¹⁹ the mean mesio-distal²²⁰ diameters of the incisors between the two groups. Thus

racial variation exists in tooth sizes ²²¹ and proper testing should be required ²²² regarding the applicability ⁷ of any prediction equation and charts based on one population to be used ²²³ on another.

Sharon Lee-Chan et al²⁶ found in their study that the limitations of the Tanaka -Johnson's ¹ method when applied to a sample population of other than European descent because these tests were developed based on them. Al-Khandra ²²⁴ BH21 found in his study ²²⁵ the limitations of Moyer's ¹ and Tanaka-Johnson's ¹ methods when applied to a sample population of other than European descent. Kommineni et al²⁷ did a study ²²⁶ for testing the applicability ⁷ of Moyer's ¹ and Tanaka-Johnson's ¹ on Chennai ²²⁷ population, which showed overestimation in Tanaka-Johnson's ¹ predicted values and accurate estimation at 50% probability values of Moyer's ¹ chart for mandibular arch.

In this study, Moyer's ¹ predicted values (21.38) were underestimating ²²⁸ the actual measured width (21.81) of the patient's ¹ teeth. Chaiwat J, Dechkunakom S, Sawaenght P²⁸ in their study on the accuracy of Moyer's ¹ prediction charts in Thai population reported that 56% of the sample showed an underestimation by more than 2 mm, 36% showed an overestimation by more than 2 mm and ²²⁹ only 8% was accurately predicted within +/- 2 mm. Schirmer UR, Wiltshire WA⁵ compared Moyers' ¹ probability tables to a Black South African population, which was also underestimated ²³⁰, which may be due to larger posterior teeth in African people. Al-Khandra ²³¹ 21 ²³² at 75% ²³³ was overestimating the actual measured values.

In this study, the Tanaka -Johnson predicted values for maxillary canine premolars (21.82) and lower canine premolar (21.4) were overestimating the measured width (21.68) and (21.12). Al-Khandra ²³⁴ 21 ²³⁵ in his study ^{236,237} found that the prediction equations of Tanaka-Johnson overestimated the size of buccal segments in the Saudi population. Ahmad S Burhan, Fehmieh R Nawaya²⁹

found in their study that the predicted values calculated by Tanaka -Johnson's equations tended to overestimate the actual values. Goyal et al²⁴⁰ in their study found that Tanaka-Johnson mixed dentition analysis, overestimates the mesio-distal width of unerupted canine and premolars in North Indian population by 3.2 mm per arch in males and 4.0 mm/arch in females.

The results of present study indicated that the currently popular Moyer's analysis (75%) and Tanaka-Johnson prediction equations were not sufficiently accurate to predict the mesio-distal widths of unerupted cuspid and bicuspid in Marathwada population.

CONCLUSION

Result of this study revealed that measured widths of canine and premolars were significantly different from the predicted widths obtained from Moyer's and Tanaka-Johnston analysis, hence, further studies are required with more number of samples for the study to be valid in a wider range.

In this study greater sexual dimorphism was evident in mesio-distal widths of lower incisor, upper canine premolars & lower canine premolar. Moyer's analysis at 75% level underestimated, whereas Tanaka-Johnston equation overestimated actual mesio-distal widths of canine and premolars in between age group of 13-16 years of males and females in Marathwada population.

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1.	<i>Moyer's; ';</i> <i>Tukey's; Moyer'; Turkey's; sample's; Johnson's; Tanaka-Johnson's; patient's; Moyers'; Jano ';</i> <i>Filipovi ';</i>	Text Inconsistencies	Correctness
2.	the mixed	Determiner Use (a/an/the/this, etc.)	Correctness
3.	for → of	Wrong or Missing Prepositions	Correctness
4.		Intricate Text	Clarity
5.	The most	Determiner Use (a/an/the/this, etc.)	Correctness
6.	Tanaka-Johnston's	Incorrect Noun Number	Correctness
7.	<i>applicability; Applicability</i>	Text Inconsistencies	Correctness
8.		Intricate Text	Clarity
9.		Intricate Text	Clarity
10.	By using → Using	Wordy Sentences	Clarity
11.	an accuracy, or the accuracy	Determiner Use (a/an/the/this, etc.)	Correctness
12.	mesio-distal → mesiodistal	Misspelled Words	Correctness
13.	<i>were measured</i>	Passive Voice Misuse	Clarity
14.	that mixed dentition analysis, those mixed dentition analyses	Determiner Use (a/an/the/this, etc.)	Correctness
15.	<i>was carried</i>	Passive Voice Misuse	Clarity
16.		Intricate Text	Clarity
17.	<i>were used</i>	Passive Voice Misuse	Clarity
18.	both,	Punctuation in Compound/Complex	Correctness

		Sentences	
19.	females,	Punctuation in Compound/Complex Sentences	Correctness
20.	mesio-distal → mesiodistal	Misspelled Words	Correctness
21.		Intricate Text	Clarity
22.	mesio-distal → mesiodistal	Misspelled Words	Correctness
23.	The result	Determiner Use (a/an/the/this, etc.)	Correctness
24.	the current	Determiner Use (a/an/the/this, etc.)	Correctness
25.	analysis → analyses	Incorrect Noun Number	Correctness
26.	the Marathwada	Determiner Use (a/an/the/this, etc.)	Correctness
27.	, further → ; further, . Further	Punctuation in Compound/Complex Sentences	Correctness
28.	are required	Passive Voice Misuse	Clarity
29.	number of	Misuse of Quantifiers	Correctness
30.	study → review, research, investigation	Word Choice	Engagement
31.	in a wider → in a broader, on a broader, in the broader	Word Choice	Engagement
32.	Kewords → Keywords	Misspelled Words	Correctness
33.	a great → an excellent	Word Choice	Engagement
34.	important → critical	Word Choice	Engagement

35.	a mixed	Determiner Use (a/an/the/this, etc.)	Correctness
36.	an early	Determiner Use (a/an/the/this, etc.)	Correctness
37.	be achieved	Passive Voice Misuse	Clarity
38.	that include → :	Wordy Sentences	Clarity
39.	, and	Comma Misuse within Clauses	Correctness
40.	methods → techniques	Word Choice	Engagement
41.	, such → ; such, , and such, . Such	Punctuation in Compound/Complex Sentences	Correctness
42.	complex → sophisticated	Word Choice	Engagement
43.	methods → processes	Word Choice	Engagement
44.	In order to → To	Wordy Sentences	Clarity
45.	, and	Comma Misuse within Clauses	Correctness
46.	rapid and straightforward	Word Choice	Engagement
47.	were established	Passive Voice Misuse	Clarity
48.	odontometric → photometric	Misspelled Words	Correctness
49.	mesio-distal → mesiodistal	Misspelled Words	Correctness
50.	as well as → and	Wordy Sentences	Clarity
51.	been already proved	Passive Voice Misuse	Clarity
52.	To date, no → No	Wordy Sentences	Clarity
53.	regarding	Wrong or Missing Prepositions	Correctness

54.	study → education, investigation	Word Choice	Engagement
55.	the regional	Determiner Use (a/an/the/this, etc.)	Correctness
56.	the applicability of	Wordy Sentences	Clarity
57.	Johnston → Johnston's	Incorrect Noun Number	Correctness
58.	after after	Misspelled Words	Correctness
59.	the institutional	Determiner Use (a/an/the/this, etc.)	Correctness
60.	, and	Comma Misuse within Clauses	Correctness
61.	consent,	Punctuation in Compound/Complex Sentences	Correctness
62.		Intricate Text	Clarity
63.	was consisting → consisted	Incorrect Verb Forms	Correctness
64.		Intricate Text	Clarity
65.	Patient → Patients	Incorrect Noun Number	Correctness
66.	serious → severe	Word Choice	Engagement
67.	problem → problems	Incorrect Noun Number	Correctness
68.	the Marathwada	Determiner Use (a/an/the/this, etc.)	Correctness
69.	hypo calcification	Misspelled Words	Correctness
70.	<i>Teeth with clinical evidence of hypoplasia or hypocalcification.</i>	Incomplete Sentences	Correctness
71.	, or	Comma Misuse within Clauses	Correctness

72.	<i>The subject with a history of orthodontic therapy.</i>	Incomplete Sentences	Correctness
73.	<i>spee</i>	Unknown Words	Correctness
74.	<i>, or</i>	Comma Misuse within Clauses	Correctness
75.	<i>were made</i>	Passive Voice Misuse	Clarity
76.	<i>was used</i>	Passive Voice Misuse	Clarity
77.	impressions → ideas, opinions	Word Choice	Engagement
78.	<i>, and</i>	Punctuation in Compound/Complex Sentences	Correctness
79.	<i>an accuracy</i>	Determiner Use (a/an/the/this, etc.)	Correctness
80.		Passive Voice Misuse	Clarity
81.	major → primary, significant, principal	Word Choice	Engagement
82.		Intricate Text	Clarity
83.	<i>Priest.6.</i>	Closing Punctuation	Correctness
84.	<i>Further,</i>	Comma Misuse within Clauses	Correctness
85.	<i>incisors,</i>	Punctuation in Compound/Complex Sentences	Correctness
86.	<i>were noted</i>	Passive Voice Misuse	Clarity
87.	spread sheets → spreadsheets	Confused Words	Correctness
88.	was → were	Faulty Subject-Verb Agreement	Correctness
89.	<i>was entered</i>	Passive Voice Misuse	Clarity

90.	data → information	Word Choice	Engagement
91.	was → were	Faulty Subject-Verb Agreement	Correctness
92.	<i>was expressed</i>	Passive Voice Misuse	Clarity
93.	mean; → mean,	Punctuation in Compound/Complex Sentences	Correctness
94.	deviation; → deviation,	Punctuation in Compound/Complex Sentences	Correctness
95.	values; → values,	Punctuation in Compound/Complex Sentences	Correctness
96.	, and	Punctuation in Compound/Complex Sentences	Correctness
97.	<i>were calculated</i>	Passive Voice Misuse	Clarity
98.	deviation → difference	Word Choice	Engagement
99.	<i>was carried</i>	Passive Voice Misuse	Clarity
100.		Intricate Text	Clarity
101.	Turkey's post → Turkey's post	Improper Formatting	Correctness
102.	<i>were used</i>	Passive Voice Misuse	Clarity
103.	<i>was placed</i>	Passive Voice Misuse	Clarity
104.	The graph, or A graph	Determiner Use (a/an/the/this, etc.)	Correctness
105.	mesio-distal → mesiodistal	Misspelled Words	Correctness

106.	the lower	Determiner Use (a/an/the/this, etc.)	Correctness
107.	subject → subjects	Incorrect Noun Number	Correctness
108.	subject,	Punctuation in Compound/Complex Sentences	Correctness
109.	a mean	Determiner Use (a/an/the/this, etc.)	Correctness
110.	mesio-distal → mesiodistal	Misspelled Words	Correctness
111.	widths → diameters	Word Choice	Engagement
112.	larger → more significant	Word Choice	Engagement
113.	mesio-distal → mesiodistal	Misspelled Words	Correctness
114.	, and	Punctuation in Compound/Complex Sentences	Correctness
115.	graph,	Comma Misuse within Clauses	Correctness
116.	mesio-distal → mesiodistal	Misspelled Words	Correctness
117.	were → was	Faulty Subject-Verb Agreement	Correctness
118.	larger → more significant	Word Choice	Engagement
119.	Comparison of → Comparing	Wordy Sentences	Clarity
120.	mesio-distal → mesiodistal	Misspelled Words	Correctness
121.	p-value → p-value	Misspelled Words	Correctness
122.	UCPM → CPM	Misspelled Words	Correctness
123.	mesio-distal → mesiodistal	Misspelled Words	Correctness

124.	were → was	Faulty Subject-Verb Agreement	Correctness
125.	2 → two	Improper Formatting	Correctness
126.	in	Wordy Sentences	Clarity
127.	mesio-distal → mesiodistal	Misspelled Words	Correctness
128.	Comparison of → Comparing	Wordy Sentences	Clarity
129.	mesio-distal → mesiodistal	Misspelled Words	Correctness
130.	p-value → p-value	Misspelled Words	Correctness
131.	UCPM → CPM	Misspelled Words	Correctness
132.	mesio-distal → mesiodistal	Misspelled Words	Correctness
133.	were → was	Faulty Subject-Verb Agreement	Correctness
134.	3 → three	Improper Formatting	Correctness
135.	mesio-distal → mesiodistal	Misspelled Words	Correctness
136.	mesio-distal → mesiodistal	Misspelled Words	Correctness
137.	p-value → p-value	Misspelled Words	Correctness
138.	UCPM → CPM	Misspelled Words	Correctness
139.	mesio-distal → mesiodistal	Misspelled Words	Correctness
140.	The descriptive, or A descriptive	Determiner Use (a/an/the/this, etc.)	Correctness
141.	statistic → statistics	Incorrect Noun Number	Correctness
142.	mesio-distal → mesiodistal	Misspelled Words	Correctness

143.	widths → diameters	Word Choice	Engagement
144.	significant → substantial	Word Choice	Engagement
145.	mesio-distal → mesiodistal	Misspelled Words	Correctness
146.	an important → an essential, a critical	Word Choice	Engagement
147.	important → essential, vital	Word Choice	Engagement
148.	, and	Comma Misuse within Clauses	Correctness
149.	find out → determine	Wordy Sentences	Clarity
150.	etc.	Comma Misuse within Clauses	Correctness
151.	, and	Comma Misuse within Clauses	Correctness
152.	mesio-distal → mesiodistal	Misspelled Words	Correctness
153.	permanent mandibular	Misplaced Words or Phrases	Correctness
154.		Intricate Text	Clarity
155.	incisors.	Closing Punctuation	Correctness
156.	a worldwide	Determiner Use (a/an/the/this, etc.)	Correctness
157.	mesio-distal → mesiodistal	Misspelled Words	Correctness
158.	mesio-distal → mesiodistal	Misspelled Words	Correctness
159.	This → This	Misspelled Words	Correctness
160.	The this	Determiner Use (a/an/the/this, etc.)	Correctness
161.	common → stock	Word Choice	Engagement
162.	, that	Punctuation in Compound/Complex	Correctness

		Sentences	
163.	that is, → :	Wordy Sentences	Clarity
164.	clinician,	Comma Misuse within Clauses	Correctness
165.	difficult → challenging	Word Choice	Engagement
166.	plan,	Punctuation in Compound/Complex Sentences	Correctness
167.		Intricate Text	Clarity
168.	mesio-distal → mesiodistal	Misspelled Words	Correctness
169.	incisors → teeth	Word Choice	Engagement
170.	<i>The sum of the mesio-distal widths of the four mandibular permanent incisors are the best predictors for un-erupted cuspid and bicuspid as indicated by multiple regression analyses.8, 4, 9 The permanent mandibular incisors were chosen for prediction because they erupt into the mouth early in mixed ...</i>	Hard-to-read text	Clarity
171.	<i>been carried</i>	Passive Voice Misuse	Clarity
172.	<i>been established</i>	Passive Voice Misuse	Clarity
173.		Intricate Text	Clarity
174.	, and	Comma Misuse within Clauses	Correctness
175.	uniqueness; → uniqueness,	Punctuation in Compound/Complex Sentences	Correctness
176.	mesio-distal → mesiodistal	Misspelled Words	Correctness
177.	the mandibular, or a mandibular	Determiner Use (a/an/the/this, etc.)	Correctness

178.	),	Punctuation in Compound/Complex Sentences	Correctness
179.	, statistical	Punctuation in Compound/Complex Sentences	Correctness
180.	larger → more abundant	Word Choice	Engagement
181.	greater → higher, more significant, more excellent, more magnificent	Word Choice	Engagement
182.	insignificant,	Punctuation in Compound/Complex Sentences	Correctness
183.	, as	Punctuation in Compound/Complex Sentences	Correctness
184.	been noted	Passive Voice Misuse	Clarity
185.	et al → et al.	Comma Misuse within Clauses	Correctness
186.	study → research	Word Choice	Engagement
187.	mesio-distal → mesiodistal	Misspelled Words	Correctness
188.	greater → more significant, higher	Word Choice	Engagement
189.	et al → et al.	Comma Misuse within Clauses	Correctness
190.	, and	Comma Misuse within Clauses	Correctness
191.	in	Wordy Sentences	Clarity
192.	, the	Punctuation in Compound/Complex Sentences	Correctness

193.	<i>was considered</i>	Passive Voice Misuse	Clarity
194.	mesio-distal → mesiodistal	Misspelled Words	Correctness
195.	mesio-distal → mesiodistal	Misspelled Words	Correctness
196.		Intricate Text	Clarity
197.	the present	Determiner Use (a/an/the/this, etc.)	Correctness
198.	were → was	Faulty Subject-Verb Agreement	Correctness
199.	<i>were carried</i>	Passive Voice Misuse	Clarity
200.		Intricate Text	Clarity
201.		Intricate Text	Clarity
202.	et al → et al.	Comma Misuse within Clauses	Correctness
203.	the Senegalese	Determiner Use (a/an/the/this, etc.)	Correctness
204.	population → community, society	Word Choice	Engagement
205.	population,	Punctuation in Compound/Complex Sentences	Correctness
206.	overestimated → exceeded	Word Choice	Engagement
207.	male,	Punctuation in Compound/Complex Sentences	Correctness
208.	<i>were considered</i>	Passive Voice Misuse	Clarity
209.		Intricate Text	Clarity
210.	analysed → analyzed	Mixed Dialects of English	Correctness

211.	analysed that → analysed that	Improper Formatting	Correctness
212.	the south	Determiner Use (a/an/the/this, etc.)	Correctness
213.	populations were	Wordy Sentences	Clarity
214.	mesio-distal → mesiodistal	Misspelled Words	Correctness
215.	, and	Comma Misuse within Clauses	Correctness
216.	larger → more extensive	Word Choice	Engagement
217.	sample → example	Word Choice	Engagement
218.	, but no → . Still, no	Hard-to-read text	Clarity
219.	were demonstrated	Passive Voice Misuse	Clarity
220.	mesio-distal → mesiodistal	Misspelled Words	Correctness
221.	, and	Punctuation in Compound/Complex Sentences	Correctness
222.	be required	Passive Voice Misuse	Clarity
223.	be used	Passive Voice Misuse	Clarity
224.	Khandra → Chandra	Misspelled Words	Correctness
225.	in his study	Wordy Sentences	Clarity
226.	study → review, research	Word Choice	Engagement
227.	the Chennai	Determiner Use (a/an/the/this, etc.)	Correctness
228.	underestimated	Wordy Sentences	Clarity
229.	, and	Punctuation in	Correctness

		Compound/Complex Sentences	
230.	<i>was also underestimated</i>	Passive Voice Misuse	Clarity
231.	Khandra → Chandra	Misspelled Words	Correctness
232.	, at	Punctuation in Compound/Complex Sentences	Correctness
233.	%,	Punctuation in Compound/Complex Sentences	Correctness
234.	Khandra → Chandra	Misspelled Words	Correctness
235.	, in	Punctuation in Compound/Complex Sentences	Correctness
236.	in his study	Wordy Sentences	Clarity
237.	study,	Punctuation in Compound/Complex Sentences	Correctness
238.	in their study	Wordy Sentences	Clarity
239.	study → research	Word Choice	Engagement
240.	values → costs, benefits	Word Choice	Engagement
241.	study → research	Word Choice	Engagement
242.	study,	Punctuation in Compound/Complex Sentences	Correctness
243.	analysis,	Punctuation in Compound/Complex Sentences	Correctness

244.	overestimates → exaggerates, exceeds	Word Choice	Engagement
245.	mesio-distal → mesiodistal	Misspelled Words	Correctness
246.	the North	Determiner Use (a/an/the/this, etc.)	Correctness
247.	the present	Determiner Use (a/an/the/this, etc.)	Correctness
248.	mesio-distal → mesiodistal	Misspelled Words	Correctness
249.		Intricate Text	Clarity
250.	The result	Determiner Use (a/an/the/this, etc.)	Correctness
251.	widths → amplitudes	Word Choice	Engagement
252.	, hence → . Hence, ; hence	Punctuation in Compound/Complex Sentences	Correctness
253.	are required	Passive Voice Misuse	Clarity
254.	study → review, research, investigation	Word Choice	Engagement
255.	in a wider → in a broader, on a broader, in the broader	Word Choice	Engagement
256.	greater → more significant	Word Choice	Engagement
257.	, greater	Punctuation in Compound/Complex Sentences	Correctness
258.	mesio-distal → mesiodistal	Misspelled Words	Correctness
259.	<i>In this study greater sexual dimorphism was evident in mesio-distal widths of lower incisor, upper canine premolars & lower canine premolar.</i>	Incomplete Sentences	Correctness

260.	mesio-distal → mesiodistal	Misspelled Words	Correctness
261.	in-between → in-between	Misspelled Words	Correctness
262.		Intricate Text	Clarity
263.	Ajdukevic → Djokovic	Misspelled Words	Correctness
264.	sevi	Unknown Words	Correctness
265.	Filipevi → Filipovic	Misspelled Words	Correctness
266.	et al → et al.	Comma Misuse within Clauses	Correctness
267.	Srideevi → Sridevi	Misspelled Words	Correctness
268.	, and	Comma Misuse within Clauses	Correctness
269.	easier → more comfortable, more natural	Word Choice	Engagement
270.	non-radiographic	Misspelled Words	Correctness
271.	the size	Determiner Use (a/an/the/this, etc.)	Correctness
272.	HH → HH	Confused Words	Correctness
273.	Sonahita → Sonata	Misspelled Words	Correctness
274.		Intricate Text	Clarity
275.	Almeida,	Punctuation in Compound/Complex Sentences	Correctness
276.	the mesiodistal, or a mesiodistal	Determiner Use (a/an/the/this, etc.)	Correctness
277.	Rani,	Punctuation in Compound/Complex Sentences	Correctness

278.	the south	Determiner Use (a/an/the/this, etc.)	Correctness
279.	Chwa → Chewa	Misspelled Words	Correctness

Recent Advancements in Intraoral Scanner corrected

by MIDSr Dental

General metrics

25,189

characters

3,828

words

262

sentences

15 min 18 sec

reading
time

29 min 26 sec

speaking
time

Score



49

Writing Issues

341

Issues left

171

Critical

170

Advanced

This text scores better than 49%
of all texts checked by Grammarly

Plagiarism



8
%

24
sources

8% of your text matches 24 sources on the web
or in archives of academic publications

Writing Issues

79

Clarity

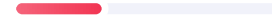
44

Passive voice misuse



18

Intricate text



17

Wordy sentences



224

Correctness

7

Confused words



55

Determiner use (a/an/the/this, etc.)



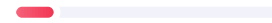
32

Comma misuse within clauses



8

Faulty subject-verb agreement



34

Punctuation in compound/complex sentences



39

Misspelled words



4

Text inconsistencies



4

Pronoun use



2

Misplaced words or phrases



4

Wrong or missing prepositions



5

Misuse of semicolons, quotation marks, etc.



6

Improper formatting



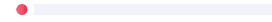
6

Mixed dialects of english



2

Closing punctuation



6

Incorrect noun number



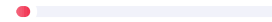
7

Incomplete sentences



3

Unknown words



37

Engagement

35

Word choice



2 Monotonous sentences 

1 **Delivery**

1 Inappropriate colloquialisms 

Unique Words

29%

Measures vocabulary diversity by calculating the percentage of words used only once in your document

unique words

Rare Words

44%

Measures depth of vocabulary by identifying words that are not among the 5,000 most common English words.

rare words

Word Length

5.1

Measures average word length

characters per word

Sentence Length

14.6

Measures average sentence length

words per sentence

Recent Advancements in Intraoral Scanner corrected

Digital Dentistry: An Overview on Recent Advancements in Intraoral Scanner

Dr. Suresh S. Kamble, Dr. Ajit S. Jankar, Dr. Vidya A. Vaybase, Dr. Shital Wagh, Dr. Pratiksha Somwanshi.

Abstract:

New devices are continuously introduced¹ in the clinic and the dental laboratory. The first phase of the digital workflow is to obtain an image with the help of intra-oral^{2,3} scanner. These devices are replacing conventional impressions techniques with the digital⁴ scanners. Impressions which are recorded⁵ using scanners are more accurate as compared to conventional technique^{6,7}. Intra-oral scanners are time efficient, decrease the patient's discomfort and⁸ make clinical procedures easier. Over the last few years, there has been new⁹ advances in dental scanners for comprehension of computerized work process¹⁰. Presently in market¹¹ there are several brands of the scanners with better features to obtain digital impressions, to record the accurate Data in comfortable working time for the dentist and patient¹². Therefore, it is convenient to analyze the most used IOS systems based on the available^{13,14} scientific data.

Keywords: Digital dentistry, Intra-oral scanners, Digital Impressions, CAD/CAM, Chair side¹⁵ milling unit, Open System, Closed System.

Introduction:

In Mid-twentieth¹⁸ century there was a rapid movement in digital technology sweeping across different industries worldwide from the military to aviation and ultimately to the health care field.¹⁹ Modern dentistry has entered in most of the²⁰ dental offices where clinicians are using digital techniques over conventional technique.¹

Computerized digital technologies has²¹ significantly progressed and have come with innovations such as digital extra-oral and intra-oral scanners, cone²² beam computed tomography, three-dimensional printers, laser sintering units and²³ milling machines.² CAD/CAM technology is employed in the fabrication of restorations, especially inlays, onlays,²⁴ bridges, veneers, ceramic crowns and²⁵ implant abutments.³

³⁴³ According to GPT 9^{26 27} the Dental Impression is a negative likeness or copy in reverse of the surface of²⁸ an object; an imprint of the teeth and adjacent structures for use in dentistry.⁴

The aim of dental impression is to record the accurate details of the patient's intraoral structures and translate it into a model. Various types of materials and impression techniques have been performed throughout the years to attain desired exactness. Enhancement of a dental impression is measured by its precision.⁵

Formerly impressions were made using impression plaster. To overcome the disadvantages of impression plaster, reversible hydrocolloid Agar was developed in 1937. Due to complex handling technique of Agar was then replaced by irreversible hydrocolloid Alginate. Elastomeric impression materials were developed to overcome hydrocolloid problems in 1950. Yet, there is inaccuracy in impressions. To overcome the imprecision, digital intraoral scanners were invented.

The development of CAD/CAM is based around three elements: Data Acquisition unit, Data Processing and Design unit, and Manufacturing unit. In the CAD phase Data acquisition and Data processing of the system play roles, while the Manufacturing unit works under the CAM phase. With the help of CAD/CAM technology clinician can record the digital impressions, design the restorations and also mill the fixed restorations along chair-side operating in-office milling units.

Based on digital data sharing capacity CAD/CAM systems is alienated into two types: open system and closed system. This article explains the characteristics of some major intraoral digital impression devices currently available and focuses on categories, working principles, and operation.

Some major Intra-oral digital scanning devices are

CEREC system

Lava C.O.S. system

3M true definition scanner

iTero system

E4D system

PlanScan

TRIOS system

CS3500 intraoral digital impression scanner

IOS FastScan

DENSYS3D

DPI - 3D

3D PROGRESS

DIRECTSCAN

Cara i500

Bluescans-I

CEREC System (Sirona, Bensheim, Germany, 1987):11

344 | First intraoral digital impression and CAD/CAM device used in the dentistry.⁵⁵
 CEREC system works on the principle of "Triangulation of Light".⁵⁶ An opaque powder of Titanium dioxide is coated before the scanning so that light dispersion will be even and ultimately increases scan accuracy. CEREC system employed with blue light-emitting diodes (LEDs)²⁶ the shorter-wavelength, intense, blue light. Scanned images are distortion-free,⁵⁷ so that stitching of multiple images is possible with great⁵⁸ accuracy. It is a closed system, exports the digital impression data with only Sirona's supporting CAM²⁶ devices like CEREC MC and CEREC In-Lab. It takes 1 minute⁵⁹ to scan one quadrant and few seconds to scan opposing⁶¹ quadrant of arch.⁶²

In 2012 CEREC AC Omnicam was launched in the market and can be used for a single tooth, quadrant, or full arch. Most⁶³ prominent features of Omnicam are scanning does not require coating⁶⁴ of an opaque powder and⁶⁵ 3D images are obtained⁶⁶ with natural colour.⁶⁷ Chair side⁶⁸ unit so the dentist can scan⁶⁹ intra-oral

structure digitally and at the same time can fabricate the restoration in a single visit,⁷⁰ or can transfer the data to the dental laboratory by CEREC ConnectR, where the restoration design is selected virtually and later milled in laboratory.⁷¹ Four axis⁷² milling machine used for fabrication of prosthesis.

For fabrication of implant crowns, abutments scan bodies are used⁷³ for scanning.⁷⁴12

Newer inventions in CEREC devices are CEREC MC X and CEREC MC XL combined with CEREC AC Omnicam.

The modern versions of the CERECs system can fabricate single crowns, bridges, veneers, laminate, inlays and⁷⁵ onlays.⁷⁶

CEREC in Labs MC XL can mill a restoration within 4 minutes.

Earlier with CEREC Bluecam, chair-side milling was not possible also bluecam⁷⁷ was not capable of milling high strength ceramics but in recent advanced systems it is possible to mill⁷⁸ the chair-side restoration including Zirconium oxide.13

Lava C.O.S.²⁶ system (Lava Chairside Oral Scanner; 3M ESPE, Seefeld, Germany 2006):14

Brontes Technologies manufactured The Lava™ Chairside Oral Scanner (C.O.S.)²⁶ and in October⁷⁹ 2006⁸⁰ it was developed by 3M ESPE.⁸¹

The Lava C.O.S.²⁶ system works on the principle of active wavefront⁸² sampling with structured⁸³ light projection. 3M ESPE designated it as '3D in-Motion technology'. Three sensors scans⁸⁴ the structure from diverse angles consecutively and generate surface patches as in-focus and out-focus⁸⁵ data by proprietary image-processing algorithms.

The Lava C.O.S.²⁶ has scanner⁸⁶ tip of only 13.2mm wide diameter. It requires a powder coating spray (lavatm⁸⁷ powder) on the tooth surface before scanning to form a homogeneous layer. A stereolithography model is created⁸⁸ by the

manufacturer and delivered to the laboratory. All types of finish lines can be replicated on the SLA dies and allows any type of crown to be fabricated by the dental laboratory.

Scanning of implant crown is done by Biomet3i. It utilizes Encode; Biomet 3i healing cap which is attached to the implant before making an optical impression. Lava C.O.S. is a semi-open system as it is compatible with other software's such as DWOS

For fabrication of prosthesis 3- axis milling machine is used.

Advantages of the system: allows capturing 3D data in a video sequence and models the data in real time if there are holes in the scan, the dentist scans that specific area and the software patches the hole.

3M true definition scanner (3M ESPE 2013):12,15

Lava™ chair-side oral scanner presented an updated version which is 3M True Definition scanner in 2013. 3M scanner works on the "active wave-front sampling" principle to capture 3D images. The system is installed with a rotating aperture element which is placed off-axis in the optical apparatus either in the imaging or the illumination path that measures the defocus blur diameter. For scanning this system requires coating of an opaque powder (Titanium dioxide) so the scanner can locate the reference points. Scans are stored in video format which captures 20 frames per second and a complete full mouth scan with a bite registration over all time required is 5 to 8 minutes. It is an Open system so that Data exportation with third-party providers became easy.

iTero system (Cadent Inc Carstadt, NJ, 2007):12,16

This system works on the principle of Parallel "Confocal Scanning". During one scan a total of 100,000 points of laser light at 300 focal depths of the tooth structure can be obtained. iTero system does not require powder coating while

scanning. ¹¹³System is capable of recording virtual bite registration. ¹¹⁴Cadent industrial 5-axis milling machine ¹¹⁵is used for the fabrication of ¹¹⁶prosthesis. iTero ¹¹⁷is an open system. It exports digital image files as an ²⁶STL format, ¹¹which can be ¹¹⁹shared with other labs equipped with a CAD/CAM system. For an optical impression of the implant position, iTero partners with Straumann.

³⁴⁶ Straumann applies implant components according to CAD software DWOS. To determine correct implant positioning ¹²⁰a specific transfer is attached to the superior surface over the implants with three spheres.

Recent Advancements: capable of generating a ¹²¹coloured 3D virtual model, captures each prepared tooth in 15 or 20 seconds, able to convert the output files in ²⁶STL format, ¹²²powder free scanning.

E4D system (D4D Technologies, ²⁶LLC (Richardson, TX 2008):12,17

D4D technologies introduced the E4D system in 2008. The intraoral scanner is ^{123,124}organised with Optical Coherence Tomography or confocal sensor. The laser ¹²⁵digitizer ¹²⁶consist of a laser source attached to fiber optic cable, a coupler and a detector. The coupler splits the light source into two paths, ¹²⁷one path leads to the imaging optics and other ¹²⁸path directed towards the optical delay line and ³⁴⁷to the reflector. ¹³⁰It uses red laser as a light source and micro-mirrors that vibrates at a speed of 20,000 cycles per second. ¹³¹The software builds a library of images. ¹³²System does not require powder coating for scanning the intraoral structure.

Scanning ¹³³is performed at a particular angle and ¹³⁴series of images are integrated into ¹³⁶3D impression. ¹³⁷3D digital impression data can be exported into ¹³⁸STL format, ²⁶so it is a Semi-open device. In ¹³⁹case of ¹⁴⁰closed ¹⁴¹format, the ¹⁴²data ¹⁴³is sent to specific DentaLogic software for CAD work. The E4D system file can also be converted ³⁴⁸to an ²⁶STL file by D4D technology and ¹⁴⁴digital impression data can be used by ¹⁴⁵other CAD/CAM systems. This system can work with a chair-side milling device.

This system provides the relative motion effects can be tracked mathematically and removed in subsequent analysis.

PlanScan (Planmeca, driven by E4D Technologies 2015): 18

Launched¹⁴⁶ in the market on 4th February 2015. System¹⁴⁷ uses blue laser light with real-time video-streaming technology to capture the dental data, and it is powder-free¹⁴⁸ system. Chair-side design and milling is¹⁴⁹ possible with this system. As this system exports and imports STL²⁶ files, so it is an open system. Scanner¹⁵⁰ captures both hard and soft tissues of various translucencies, dental restorations, models, and conventional impressions. It has removable scanner tips with built-in heated mirrors allow¹⁵¹ for no down time¹⁵² between patients, as well as¹⁵³ high-level disinfection. Processing, designing, and manufacturing of the restorations can also be done¹⁵⁴ into the laboratory or¹⁵⁵ PlanMill 40 milling machine (Four-axis dual spindle machine) can be used¹⁵⁶ for chair-side milling of the restoration¹⁵⁷. The digital casts can be used¹⁵⁸ to design inlays, onlays¹⁵⁹, crowns, bridges, and veneers. Different scanners available are Planmeca EmeraldTM S, Planmeca Romexis.

TRIOS system (3Shape Copenhagen, Denmark 2010): 12, 19

3Shape launched the TRIOS in 2010 and bought to¹⁶⁰ market in 2011. System¹⁶¹ works on "ultrafast¹⁶² optical sectioning and confocal microscopy" principle. It uses red laser light and¹⁶³ scans are stored¹⁶⁴ in multiple image format¹⁶⁵. A quick¹⁶⁶ scanning speed of up to 3000 images per second reduces the influence of movement between scanner probe and teeth. While scanning no need of coating the intra-oral structure with an opaque¹⁶⁷ powder or spray. TRIOS has the property of telecentricity¹⁶⁸. 3D profiles of teeth and gingiva are¹⁶⁹ generated¹⁶⁹ simultaneously, while the dentist moves the scanner gradually above them.

TRIOS system has 2 parts: TRIOSR Cart and TRIOSR Pod.

It is an open system that ¹⁷⁰is able to convert 3D data into ²⁶STL file format. TRIOS is comprised ¹⁷¹with a digital impression acquisition and CAD ¹⁷²system, and does not incorporate ²⁶CAM milling device.

Upgradation: variation of the focal plane without moving the scanner due to its property of Telecentricity.

CS3500 intraoral digital impression scanner(2015): 20

CS3500 is the portable digital impression system launched at the end of 2015. ¹⁷³System works on the "confocal laser scanner microscopy" technique ¹⁷⁴which ¹⁷⁵allows ¹⁷⁶to capture the true-color 2D and high-angulation 3D scans of up to 45° angle with a depth of -2 to 13 mm. ¹⁷⁷No need to use ¹⁷⁸opaque powder for scanning. ¹⁷⁹Resolution of captured images is 1024 x 728 pixels and ¹⁸⁰the accuracy is ¹⁸¹upto 30 microns. ¹⁸²Mirror fogging while scanning is ¹⁸³prevented with the help of ¹⁸⁴built-in heater streamlines. The green light during scanning indicates a successful scan while the amber light shows that a rescanning of the area of the interest. About 10 minutes ¹⁸⁵are required ¹⁸⁶for scanning of the full arch. CS 3500 is well-matched with open source software ¹⁸⁷or ¹⁸⁸it can also work with Carestream CAD/CAM dental restorations system.

350 | IOS FastScan – by IOS TECHNOLOGIES, INC.5. ²⁶(US 2007):12,18,20

351 | IOS technologies launched IOS FastScan in 2007. This system works on the principle of "active triangulation". The light from two ¹⁸⁹perspective ¹⁹⁰is combined onto a single camera using passive or active triangulation. Glidewell

Laboratories ²⁶(CA) is the main clinical testing facility for IOS technologies!. In ¹⁹¹this ¹⁹²system camera moves within the wand. ¹⁹²Probe of the 3D scanner sweeps a sheet of light across one or more surfaces of teeth, where the ¹⁹³sheet of ¹⁹⁴light projector and imaging aperture within the scanner probe rapidly moves back and forth along all or part of the full scan ¹⁹⁵path, and displays the real-time, live 3D preview of the digital 3D model of the scanned intraoral structure. ¹⁹⁵A 3D

¹⁹⁶ preview provides information about the position and orientation of the probe
 according to the intraoral structure that is to be scanned ^{197 198} .
 Stores the scanned data in STL format, an open source data format that all the
 laboratories can recognize and manipulate it accordingly. ^{200 201} IOS FastScan™
 includes a scanner to captures the data along with the ²⁰² three dimensional
 shape of dentition. The system has ²⁰³ inbuilt CAD module to store the ²⁰⁴ colour and
 translucency information and the 3D ^{205 206} shape , to concentrate a ²⁰⁷ coloured
 accurate representation of the prosthesis. The ²⁰⁸ colour, translucency and ²⁰⁹
³⁵⁴ surface information are ²¹⁰ combined in a single digital prescription, ²¹¹ which is
 electronically transferred ²¹² to a laboratory or CAD/CAM system for fabrication.
^{213 26} DENSYS 3D MIA3d (IL) (Migdal Ha'Emeq, Israel, February 2009):21
 MIA3d launched ^{214 215} Densys 3D which is a separate chair-side scanner. Works on
 the "active stereophotogrammetry" principle with ²¹⁶ structured light projection.
 The intra-oral scan is illuminated by a 2D array of structured illumination. ²¹⁷ Files
 are saved into ASCII format ^{218 219 220 221} which are formed with visible lights. This system
 requires ²²² contrast medium before ^{223 224} scanning procedure.
³⁵⁵ ^{225 226} Densys scanning system is the easy to use software, the fastest calculation
 and the most accurate and robust wand in the market, with full interproximal
 scan coverage. ^{227 228} Aim of this system is to duplicate the 3D intra-oral structures
 for dental uses such as veneers, laminates, inlays, ²²⁹ onlays with minimal
³⁵⁶ apparatus. ²³⁰ Minimize the effect of movement of the patient, the practitioner,
 and the apparatus, during the procedure of 3D intra-oral imaging. ^{231 232}
 DPI - 3D BY DIMENSIONAL PHOTONICS INTERNATIONAL, INC. (US
 1990s):12,20,22
 DPI-3D is the leading developer of innovative 3D measurement and shape
 capture technology. Firstly it is considered at Massachusetts Institute of
 Technology (MIT) ²⁶ Lincoln Laboratory in the late 1990s. This system is the most

precise and multipurpose 3D scanning technologies. DPI - 3D works on an "accordion fringe interferometry" principle. It extends traditional linear laser interferometry to three dimensions.

The MIT Lincoln Laboratory performed original work on AFI. AFI has many benefits over older "white light" scanners as lower sensitivity to ambient light, noise, good accuracy, large projector depth of field and has greater ability to scan shiny surfaces. Scanner has the 350nm to 500 nm wavelength which reduces the measurement errors. It is an Open system as the files are saved in STL format. Scanned data can be stored in multiple image format. No need of coating the teeth surface with powder or spray.

Advantage of this system is wavelength of the light source enables lower sensitivity to ambient light variations and noise which enhances the ability to scan shiny and translucent surfaces.

3D PROGRESS (2015):12,20

357 | MHT Optic Research AG and MHT S.P.A. launched 3D Progress which is a light-weight, portable digital impression system. The technology of the 3D progress is the confocal microscopy combined with the detection of the effect Moiré (The Moiré patteren appears as a result of an interaction between transparent layers of repeated structure, when superimposed layers are viewed through), a kind of structured light. Data collected is shown in real time on computer screen. Scanning of oral tissue without use of opacifiers. Real time automatic stitching of scanned images is possible. 3D Progress takes impression less than 1/10th of a second for a single scan and scans a full-arch in under 3 minutes. 3D Progress does not require powdering of the translucent surfaces. While scanning highly reflective surfaces requires the coating of opaque powder for example, implant scan abutments and markers. A smart Pixel Sensor that enables fast and accurate scanning, each single scan is

359 automatically stitched. This system is capable of an automatically²⁶² (or semi-automatically) detects the margin line or finish line. 3D Progress²⁴⁷ works as a confocal microscope combined with Moiré effect²⁶³ detection.

DIRECTSCAN BY HINT – ELS GMBH (DE, 2011):18

Directscan²⁶⁴ by HINT is based on the principle of human stereoscopic vision and on the principle of the linear projection. By the end of 2010²⁶⁸ the company Hint-els® announced, for the first quarter of 2011, the launch of its Directscan.

Scans are taken in a speedy sequence from various angles every 200 milliseconds, recording the surface and shape of every tooth or gap.²⁶⁹ The images are stored²⁷⁰ into 3D software, which conducts a pixel-precise comparison to map the intraoral structures.

360 Scanned Data^{142,271} is stored in STL²⁶ format and can be processed with both the CAD/CAM components and with²⁷² other open systems. Software²⁷³ includes a virtual articulator and allows the modeling of fully anatomical inlays, crowns and long span²⁷⁴ bridges.²⁷⁵

Cara i500 (Kulzer's Developed in partnership with Medit 2018):20

This scanner has Cloud based workflow management system,²⁷⁶ greater precision²⁷⁷ and improved accuracy,²⁷⁸ ease of use, scaling work routines, increased efficiency,²⁷⁹ quick and easy operation.

A more integrated workflow - digitized data can be easily imported²⁸⁰ into any CAD software, print with cara²⁸¹ Print 4.0 and dima²⁸² Print Materials, Small tip²⁸³ and powder-free scanning make the process comfortable for the patient. Medit scanners can store scans either Raw format or Processed format called MeditMesh.

Double focus:²⁸⁴ Two high-speed cameras ensure fast results and high-resolution images thanks to rapid, video-based scans. The open system can export the

.stl, .ply, or .obj files for more convenient processing and design, Vivid, precise colored scans for easy differentiation between soft tissue, plaque and teeth.²⁸⁵
Wide range of indications like fabrication of single custom abutment, inlays and onlays, single crown, veneer, 3 unit implant bridge upto 5 units, implant guide, denture workflows.^{287 288 289 290}

Functionalities:

Installed with iScan features, with the help of which functions like automatic and manual margin line creation and editing options. During scanning the patient's arch or teeth, dentist²⁹¹ can add or edit control points to the prepared teeth scan data to create the true²⁹² margin line. HD²⁶ intraoral Camera is used²⁹³ to take HD²⁶ pictures.

Bluescan-I²⁹⁴ :20

Bluescan-I²⁹⁵ has been developed in co-operation with the largest,²⁹⁶ independent Austrian Research Institute (AIT)²⁶ and is a highly complex optic measurement-system which takes 8–15 stereo images per second.²⁹⁷

In this system, taking impressions of teeth is like taking a video with an easy²⁹⁸ and free-moving hand piece²⁹⁹ with integrated optics an anti-shake³⁰⁰ protection, the camera does not have to be held³⁰¹ still and calibrated.³⁰²

The camera head is warmed by body heat and internal electrics to prevent fogging; it produces high-definition and very high resolution³⁰³ real-time images in just milliseconds with^{304,305}.

The wand is really small³⁰⁶ and light. Low size STL²⁶ file is available for further process.

No spray or powder is required³⁰⁷ with the Bluescan-I³⁰⁸.

Bluescan-I³⁰⁹ operates according to active stereoscopic vision principle oral scans are performed by a camera system that consists of two cameras, which

record stereoscopic images for the three-dimensional measurement of the object.

This system incorporated with a ³¹⁰very small wand and is portable and connects to ²⁶PC via USB 2.0 cable.

Conclusion:

Digital technology has affected and is affecting the profession of dentistry. Patients also prefer digital dentistry, as it is more comfortable compared to traditional impressions. Besides, it minimizes chair and office time, making the office significantly more efficient, reduces remakes, reduces seating time of restorations, and lowers or eliminates laboratory bills.

Studies have shown that digital impressions are at least as accurate as ³⁶¹conventional impressions. Retakes are quick, ³¹¹easy and inexpensive. Digital ³¹²impressions are ³¹³easier to store because they do not take up space. There is no need for disinfectants, pulls, bubbles, tears and ³¹⁴practitioners want to know which intraoral scanning device is the best one. ³¹⁵This article gives a review on ³¹⁶different types of scanners available in the market. ³¹⁷Also a lot of the examined ³¹⁸devices are not commercially available and they ³¹⁹are not still presented to the ³²⁰market. ³²¹The advanced upgrading of the intraoral digital impression technique will lead to its extensive use in dentistry.

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1.	<i>are continuously introduced</i>	Passive Voice Misuse	Clarity
2.	intra-oral → intraoral	Confused Words	Correctness
3.	an intra-oral	Determiner Use (a/an/the/this, etc.)	Correctness
4.	the digital	Determiner Use (a/an/the/this, etc.)	Correctness
5.	<i>are recorded</i>	Passive Voice Misuse	Clarity
6.	conventional → traditional	Word Choice	Engagement
7.	the conventional, or a conventional	Determiner Use (a/an/the/this, etc.)	Correctness
8.	technique → method, technology	Word Choice	Engagement
9.	, and	Comma Misuse within Clauses	Correctness
10.	has → have	Faulty Subject-Verb Agreement	Correctness
11.	the computerized, or a computerized	Determiner Use (a/an/the/this, etc.)	Correctness
12.		Intricate Text	Clarity
13.	the market	Determiner Use (a/an/the/this, etc.)	Correctness
14.	market,	Comma Misuse within Clauses	Correctness
15.		Intricate Text	Clarity
16.	the available	Determiner Use (a/an/the/this, etc.)	Correctness
17.	Chair-side → Chairside	Confused Words	Correctness
18.	the Mid-twentieth	Determiner Use (a/an/the/this, etc.)	Correctness

19.		Intricate Text	Clarity
20.	of the	Wordy Sentences	Clarity
21.	has → have	Faulty Subject-Verb Agreement	Correctness
22.	, cone → ; cone, , and cone, . Cone	Punctuation in Compound/Complex Sentences	Correctness
23.	, and	Comma Misuse within Clauses	Correctness
24.	enlays → inlays	Misspelled Words	Correctness
25.	, and	Comma Misuse within Clauses	Correctness
26.	GPT; CAM; C.O.S.; LEDs; SLA; STL; LLC; US; CA; IL; MIT; DPI; AFI; MHT; S.P.A.; HD; AIT; PC; C.O.S; OPZ; OBY; DPI's	Text Inconsistencies	Correctness
27.	9,	Comma Misuse within Clauses	Correctness
28.	the surface of	Wordy Sentences	Clarity
29.	the dental	Determiner Use (a/an/the/this, etc.)	Correctness
30.	Dental impression aims	Wordy Sentences	Clarity
31.	it → them	Pronoun Use	Correctness
32.		Intricate Text	Clarity
33.	impression → print, feeling, perception, reaction	Word Choice	Engagement
34.	impression → feeling, impact, idea	Word Choice	Engagement
35.		Passive Voice Misuse	Clarity

36.	<i>To overcome the disadvantages of impression plaster</i>	Misplaced Words or Phrases	Correctness
37.	<i>was developed</i>	Passive Voice Misuse	Clarity
38.	complex → sophisticated	Word Choice	Engagement
39.	the complex	Determiner Use (a/an/the/this, etc.)	Correctness
40.	<i>were developed</i>	Passive Voice Misuse	Clarity
41.	developed → designed	Word Choice	Engagement
42.	<i>To overcome the imprecision</i>	Misplaced Words or Phrases	Correctness
43.	<i>were invented</i>	Passive Voice Misuse	Clarity
44.	<i>is based</i>	Passive Voice Misuse	Clarity
45.	, and	Comma Misuse within Clauses	Correctness
46.	unit → group	Word Choice	Engagement
47.		Intricate Text	Clarity
48.	, Data	Punctuation in Compound/Complex Sentences	Correctness
49.	unit → group	Word Choice	Engagement
50.	along with	Wrong or Missing Prepositions	Correctness
51.	data sharing → data-sharing	Misspelled Words	Correctness
52.	, CAD	Punctuation in Compound/Complex Sentences	Correctness
53.	is → are	Faulty Subject-Verb Agreement	Correctness
54.	major → significant	Word Choice	Engagement

55.	the dentistry	Determiner Use (a/an/the/this, etc.)	Correctness
56.	; → ."	Misuse of Semicolons, Quotation Marks, etc.	Correctness
57.	distortion-free,	Punctuation in Compound/Complex Sentences	Correctness
58.	great → high	Word Choice	Engagement
59.	1 → one	Improper Formatting	Correctness
60.	minute → minutes, minute	Misspelled Words	Correctness
61.	the opposing	Determiner Use (a/an/the/this, etc.)	Correctness
62.	the arch	Determiner Use (a/an/the/this, etc.)	Correctness
63.	The most	Determiner Use (a/an/the/this, etc.)	Correctness
64.	a coating	Determiner Use (a/an/the/this, etc.)	Correctness
65.	, and	Punctuation in Compound/Complex Sentences	Correctness
66.	are obtained	Passive Voice Misuse	Clarity
67.	colour → color	Mixed Dialects of English	Correctness
68.	Chair side → Chairside	Confused Words	Correctness
69.	scan → examine	Word Choice	Engagement
70.	visit,	Comma Misuse within Clauses	Correctness
71.	the laboratory, or a laboratory	Determiner Use (a/an/the/this, etc.)	Correctness

72.	Four axis → Four-axis	Misspelled Words	Correctness
73.	are used	Passive Voice Misuse	Clarity
74.	scanning.12.	Closing Punctuation	Correctness
75.	, and	Comma Misuse within Clauses	Correctness
76.	onlays → Onlays	Misspelled Words	Correctness
77.	bluecam → blue cam	Misspelled Words	Correctness
78.	mill → grind	Word Choice	Engagement
79.	, and	Punctuation in Compound/Complex Sentences	Correctness
80.	2006,	Punctuation in Compound/Complex Sentences	Correctness
81.	ESPE .	Improper Formatting	Correctness
82.	wavefront; wave-front	Text Inconsistencies	Correctness
83.	a structured	Determiner Use (a/an/the/this, etc.)	Correctness
84.	scans → scan	Faulty Subject-Verb Agreement	Correctness
85.	and out-focus	Improper Formatting	Correctness
86.	a scanner	Determiner Use (a/an/the/this, etc.)	Correctness
87.	lavatm → lava	Misspelled Words	Correctness
88.	is created	Passive Voice Misuse	Clarity
89.	allows → allow	Faulty Subject-Verb Agreement	Correctness
90.	type → kind	Word Choice	Engagement

91.	<i>be fabricated</i>	Passive Voice Misuse	Clarity
92.		Intricate Text	Clarity
93.	the implant	Determiner Use (a/an/the/this, etc.)	Correctness
94.		Passive Voice Misuse	Clarity
95.	, which	Punctuation in Compound/Complex Sentences	Correctness
96.	which is	Wordy Sentences	Clarity
97.	DWOS.	Closing Punctuation	Correctness
98.	real time → real-time	Misspelled Words	Correctness
99.	, which	Punctuation in Compound/Complex Sentences	Correctness
100.	a 3M	Determiner Use (a/an/the/this, etc.)	Correctness
101.	<i>is installed</i>	Passive Voice Misuse	Clarity
102.	which is	Wordy Sentences	Clarity
103.	scanning,	Comma Misuse within Clauses	Correctness
104.	a coating	Determiner Use (a/an/the/this, etc.)	Correctness
105.	, so	Punctuation in Compound/Complex Sentences	Correctness
106.	<i>are stored</i>	Passive Voice Misuse	Clarity
107.	, which	Punctuation in Compound/Complex Sentences	Correctness

108.	, and	Punctuation in Compound/Complex Sentences	Correctness
109.	Carstadt → Carlstadt	Misspelled Words	Correctness
110.	; → ."	Misuse of Semicolons, Quotation Marks, etc.	Correctness
111.	scan,	Punctuation in Compound/Complex Sentences	Correctness
112.	a total of → ,	Wordy Sentences	Clarity
113.	The system	Determiner Use (a/an/the/this, etc.)	Correctness
114.	A cadent, or The cadent	Determiner Use (a/an/the/this, etc.)	Correctness
115.	is used	Passive Voice Misuse	Clarity
116.	prosthesis → prostheses	Incorrect Noun Number	Correctness
117.	<i>System is capable of recording virtual bite registration. Cadent industrial 5-axis milling machine is used for the fabrication of prosthesis. iTero is an open system.</i>	Monotonous Sentences	Engagement
118.	which can be	Wordy Sentences	Clarity
119.	be shared	Passive Voice Misuse	Clarity
120.	, a	Punctuation in Compound/Complex Sentences	Correctness
121.	coloured → colored	Mixed Dialects of English	Correctness
122.	powder-free → powder-free	Misspelled Words	Correctness
123.	is organised	Passive Voice Misuse	Clarity

124.	organised → organized	Mixed Dialects of English	Correctness
125.	consist → consists	Faulty Subject-Verb Agreement	Correctness
126.	, and	Comma Misuse within Clauses	Correctness
127.	, one → ; one, , and one, . One	Punctuation in Compound/Complex Sentences	Correctness
128.	path → way	Word Choice	Engagement
129.	to	Wordy Sentences	Clarity
130.	a red	Determiner Use (a/an/the/this, etc.)	Correctness
131.		Intricate Text	Clarity
132.	The system	Determiner Use (a/an/the/this, etc.)	Correctness
133.	is performed	Passive Voice Misuse	Clarity
134.	, and	Punctuation in Compound/Complex Sentences	Correctness
135.	are integrated	Passive Voice Misuse	Clarity
136.	a 3D	Determiner Use (a/an/the/this, etc.)	Correctness
137.	impression → impressions	Incorrect Noun Number	Correctness
138.	be exported	Passive Voice Misuse	Clarity
139.	the case	Determiner Use (a/an/the/this, etc.)	Correctness
140.	a closed	Determiner Use (a/an/the/this, etc.)	Correctness
141.	format → form	Word Choice	Engagement

142.	<i>data; Data</i>	Text Inconsistencies	Correctness
143.	<i>is sent</i>	Passive Voice Misuse	Clarity
144.	<i>, and</i>	Punctuation in Compound/Complex Sentences	Correctness
145.	<i>be used</i>	Passive Voice Misuse	Clarity
146.	<i>They were launched, or It was launched</i>	Incomplete Sentences	Correctness
147.	<i>The system</i>	Determiner Use (a/an/the/this, etc.)	Correctness
148.	<i>a powder-free</i>	Determiner Use (a/an/the/this, etc.)	Correctness
149.	<i>is → are</i>	Faulty Subject-Verb Agreement	Correctness
150.	<i>The scanner</i>	Determiner Use (a/an/the/this, etc.)	Correctness
151.	<i>that allow</i>	Pronoun Use	Correctness
152.	<i>down time → downtime</i>	Confused Words	Correctness
153.	<i>, as well as → and</i>	Wordy Sentences	Clarity
154.	<i>be done</i>	Passive Voice Misuse	Clarity
155.	<i>, or</i>	Punctuation in Compound/Complex Sentences	Correctness
156.	<i>be used</i>	Passive Voice Misuse	Clarity
157.	<i>restoration → recovery, repair</i>	Word Choice	Engagement
158.	<i>be used</i>	Passive Voice Misuse	Clarity
159.	<i>onlays → inlays, Onlays</i>	Misspelled Words	Correctness

160.	it to	Pronoun Use	Correctness
161.	The system	Determiner Use (a/an/the/this, etc.)	Correctness
162.	the "ultrafast	Determiner Use (a/an/the/this, etc.)	Correctness
163.	, and	Punctuation in Compound/Complex Sentences	Correctness
164.	are stored	Passive Voice Misuse	Clarity
165.	format → formats	Incorrect Noun Number	Correctness
166.	A quick	Determiner Use (a/an/the/this, etc.)	Correctness
167.	an opaque → a dark	Word Choice	Engagement
168.	telecentricity	Unknown Words	Correctness
169.	are generated	Passive Voice Misuse	Clarity
170.	is able to → can	Wordy Sentences	Clarity
171.	with → of	Wrong or Missing Prepositions	Correctness
172.	system,	Comma Misuse within Clauses	Correctness
173.	The system	Determiner Use (a/an/the/this, etc.)	Correctness
174.	, which	Punctuation in Compound/Complex Sentences	Correctness
175.	which allows	Wordy Sentences	Clarity
176.	us to	Pronoun Use	Correctness
177.	No → no	Incomplete Sentences	Correctness

178.	opaque → dark	Word Choice	Engagement
179.	The resolution	Determiner Use (a/an/the/this, etc.)	Correctness
180.	, and	Punctuation in Compound/Complex Sentences	Correctness
181.	upto → up to	Misspelled Words	Correctness
182.	-Mirror → —mirror	Incomplete Sentences	Correctness
183.	is prevented	Passive Voice Misuse	Clarity
184.	of built-in → of built-in	Improper Formatting	Correctness
185.	are required	Passive Voice Misuse	Clarity
186.	scanning → digitization	Word Choice	Engagement
187.	, or	Punctuation in Compound/Complex Sentences	Correctness
188.	it can also work → works	Wordy Sentences	Clarity
189.	↵ → ."	Misuse of Semicolons, Quotation Marks, etc.	Correctness
190.	perspective → perspectives	Incorrect Noun Number	Correctness
191.	system,	Comma Misuse within Clauses	Correctness
192.	The probe, or A probe	Determiner Use (a/an/the/this, etc.)	Correctness
193.	sheet → layer	Word Choice	Engagement
194.	the light, or a light	Determiner Use (a/an/the/this, etc.)	Correctness
195.	path,	Comma Misuse within Clauses	Correctness

196.	preview → show	Word Choice	Engagement
197.	<i>be scanned</i>	Passive Voice Misuse	Clarity
198.		Intricate Text	Clarity
199.	open source → open-source	Misspelled Words	Correctness
200.	it	Wordy Sentences	Clarity
201.	<i>Stores the scanned data in STL format, an open source data format that all the laboratories can recognize and manipulate it accordingly.</i>	Incomplete Sentences	Correctness
202.	three-dimensional	Misspelled Words	Correctness
203.	an inbuilt	Determiner Use (a/an/the/this, etc.)	Correctness
204.	colour → color	Mixed Dialects of English	Correctness
205.	shape → form, way	Word Choice	Engagement
206.	shape,	Punctuation in Compound/Complex Sentences	Correctness
207.	coloured → colored	Mixed Dialects of English	Correctness
208.	colour → color	Mixed Dialects of English	Correctness
209.	, and	Comma Misuse within Clauses	Correctness
210.	<i>are combined</i>	Passive Voice Misuse	Clarity
211.	, which is	Wordy Sentences	Clarity
212.	<i>is electronically transferred</i>	Passive Voice Misuse	Clarity

213.	DENSYS → ANSYS	Misspelled Words	Correctness
214.	Densys → Denys	Misspelled Words	Correctness
215.	, which	Punctuation in Compound/Complex Sentences	Correctness
216.	a structured	Determiner Use (a/an/the/this, etc.)	Correctness
217.		Passive Voice Misuse	Clarity
218.	are saved	Passive Voice Misuse	Clarity
219.	, which	Punctuation in Compound/Complex Sentences	Correctness
220.	are → is	Faulty Subject-Verb Agreement	Correctness
221.	are formed	Passive Voice Misuse	Clarity
222.	a contrast	Determiner Use (a/an/the/this, etc.)	Correctness
223.	the scanning	Determiner Use (a/an/the/this, etc.)	Correctness
224.	<i>The intra-oral scan is illuminated by a 2D array of structured illumination. Files are saved into ASCII format which are formed with visible lights. This system requires contrast medium before scanning procedure.</i>	Monotonous Sentences	Engagement
225.	Densys → Denys	Misspelled Words	Correctness
226.	the software	Determiner Use (a/an/the/this, etc.)	Correctness
227.	, and	Comma Misuse within Clauses	Correctness
228.	The aim	Determiner Use (a/an/the/this, etc.)	Correctness

229.	<i>onlays</i>	Unknown Words	Correctness
230.		Intricate Text	Clarity
231.	apparatus → device, equipment, aircraft, machinery	Word Choice	Engagement
232.		Intricate Text	Clarity
233.	technologies → technology	Incorrect Noun Number	Correctness
234.	large → considerable, tremendous, significant	Word Choice	Engagement
235.	, and	Comma Misuse within Clauses	Correctness
236.	greater → more exceptional	Word Choice	Engagement
237.	The scanner	Determiner Use (a/an/the/this, etc.)	Correctness
238.	, which	Punctuation in Compound/Complex Sentences	Correctness
239.	are saved	Passive Voice Misuse	Clarity
240.	be stored	Passive Voice Misuse	Clarity
241.	format → formats	Incorrect Noun Number	Correctness
242.	No → no	Incomplete Sentences	Correctness
243.	ef → for	Wrong or Missing Prepositions	Correctness
244.	The advantage	Determiner Use (a/an/the/this, etc.)	Correctness
245.	the wavelength	Determiner Use (a/an/the/this, etc.)	Correctness
246.	, which	Punctuation in Compound/Complex Sentences	Correctness

247.	<i>Progress; progress</i>	Text Inconsistencies	Correctness
248.	, which	Punctuation in Compound/Complex Sentences	Correctness
249.		Intricate Text	Clarity
250.	patteren → pattern	Misspelled Words	Correctness
251.	structure,	Punctuation in Compound/Complex Sentences	Correctness
252.	are viewed	Passive Voice Misuse	Clarity
253.	real-time → real-time	Misspelled Words	Correctness
254.	a computer, or the computer	Determiner Use (a/an/the/this, etc.)	Correctness
255.	-Scanning → —scanning	Incomplete Sentences	Correctness
256.	the use	Determiner Use (a/an/the/this, etc.)	Correctness
257.	Real time → Real-time	Misspelled Words	Correctness
258.	, for	Comma Misuse within Clauses	Correctness
259.	, and	Comma Misuse within Clauses	Correctness
260.		Intricate Text	Clarity
261.	each → every	Determiner Use (a/an/the/this, etc.)	Correctness
262.	an automatically	Determiner Use (a/an/the/this, etc.)	Correctness
263.	effect → affect	Confused Words	Correctness
264.	Directscan → Direct scan	Misspelled Words	Correctness

265.	en	Wordy Sentences	Clarity
266.	principle → law	Word Choice	Engagement
267.		Intricate Text	Clarity
268.	2010,	Comma Misuse within Clauses	Correctness
269.		Intricate Text	Clarity
270.	<i>are stored</i>	Passive Voice Misuse	Clarity
271.	Data → data	Confused Words	Correctness
272.	with	Wordy Sentences	Clarity
273.	The software	Determiner Use (a/an/the/this, etc.)	Correctness
274.	, and	Comma Misuse within Clauses	Correctness
275.	long span → long-span	Misspelled Words	Correctness
276.	a Cloud	Determiner Use (a/an/the/this, etc.)	Correctness
277.	Cloud based → Cloud-based	Misspelled Words	Correctness
278.	, and	Comma Misuse within Clauses	Correctness
279.		Intricate Text	Clarity
280.	<i>be easily imported</i>	Passive Voice Misuse	Clarity
281.	cara → care	Misspelled Words	Correctness
282.	dima → Dima	Misspelled Words	Correctness
283.	, and	Punctuation in Compound/Complex Sentences	Correctness

284.	Double → Renewed	Word Choice	Engagement
285.	, and	Comma Misuse within Clauses	Correctness
286.	, and	Comma Misuse within Clauses	Correctness
287.	onlays → Onlays	Misspelled Words	Correctness
288.	upto → up to	Misspelled Words	Correctness
289.	5 → five	Improper Formatting	Correctness
290.	Wide range of indications like fabrication of single custom abutment, inlays and onlays, single crown, veneer, 3 unit implant bridge upto 5 units, implant guide, denture workflows.	Incomplete Sentences	Correctness
291.	the dentist	Determiner Use (a/an/the/this, etc.)	Correctness
292.	true → right, exact, correct, actual	Word Choice	Engagement
293.	is used	Passive Voice Misuse	Clarity
294.	Bluescans-I :	Improper Formatting	Correctness
295.	Bluescan → Blues can, Blues	Misspelled Words	Correctness
296.	largest → most significant, most extensive	Word Choice	Engagement
297.		Intricate Text	Clarity
298.	an easy → a smooth	Word Choice	Engagement
299.	hand-piece → handpiece	Confused Words	Correctness
300.	an anti-shake	Determiner Use (a/an/the/this, etc.)	Correctness

301.	,the → ; the, . The	Punctuation in Compound/Complex Sentences	Correctness
302.	<i>be held</i>	Passive Voice Misuse	Clarity
303.	high resolution → high-resolution	Misspelled Words	Correctness
304.	<i>with</i>	Inappropriate Colloquialisms	Delivery
305.	with	Wordy Sentences	Clarity
306.	really small → tiny	Word Choice	Engagement
307.	<i>is required</i>	Passive Voice Misuse	Clarity
308.	Bluescan → Blues can	Misspelled Words	Correctness
309.	Bluescan → Blues can, Blues	Misspelled Words	Correctness
310.	a very small → a tiny	Word Choice	Engagement
311.	, and	Comma Misuse within Clauses	Correctness
312.	impressions → prints, ideas, opinions	Word Choice	Engagement
313.	easier → more comfortable	Word Choice	Engagement
314.	, and	Comma Misuse within Clauses	Correctness
315.		Intricate Text	Clarity
316.	on → of	Wrong or Missing Prepositions	Correctness
317.	Also,	Comma Misuse within Clauses	Correctness
318.	devices → tools, methods	Word Choice	Engagement
319.	, and	Punctuation in Compound/Complex Sentences	Correctness

320.	<i>are not still presented</i>	Passive Voice Misuse	Clarity
321.		Intricate Text	Clarity
322.	Bouer → Bauer	Misspelled Words	Correctness
323.	, and	Comma Misuse within Clauses	Correctness
324.	Grossary → Glossary	Misspelled Words	Correctness
325.	, and	Comma Misuse within Clauses	Correctness
326.	elin → Clin	Misspelled Words	Correctness
327.	, and	Comma Misuse within Clauses	Correctness
328.	<i>onlays</i>	Unknown Words	Correctness
329.	elin → Clin	Misspelled Words	Correctness
330.	scans:	Misuse of Semicolons, Quotation Marks, etc.	Correctness
331.	, and	Comma Misuse within Clauses	Correctness
332.	shu → Shu	Misspelled Words	Correctness
333.	." → ."	Misuse of Semicolons, Quotation Marks, etc.	Correctness
334.	Poticy → Potency, Policy	Misspelled Words	Correctness
335.	estetie → esthetic	Misspelled Words	Correctness
336.	the "next	Determiner Use (a/an/the/this, etc.)	Correctness
337.	next generation → next-generation	Misspelled Words	Correctness
338.	, and	Comma Misuse within Clauses	Correctness
339.	, and	Comma Misuse within Clauses	Correctness

340.	technology,	Punctuation in Compound/Complex Sentences	Correctness
341.	ways,	Punctuation in Compound/Complex Sentences	Correctness
342.	<i>Over the last few years, there has been</i>	Over The Last Few Years, There Has Been An Increas ... https://www.chegg.com/homework-help/questions-and-answers/last-years-increase-awareness-harmful-effects-plastic-environment-plastic-straws-particula-q54069816	Originality
343.	<i>a negative likeness or copy in reverse of the surface of an object; an imprint of the teeth and adjacent structures for use in dentistry.</i>	RESEARCH ARTICLE Open Access Comparison of digital and ... https://link.springer.com/content/pdf/10.1186%2F1472-6831-14-10.pdf	Originality
344.	<i>First intraoral digital impression and CAD/CAM device</i>	Intraoral Digital Impression Technique: A Review. - PDF ... https://docksci.com/intraoral-digital-impression-technique-a-review_5a920f80d64ab25e83692507.html	Originality
345.	<i>equipped with a CAD/CAM system. For an optical impression of the implant position, iTero partners with Straumann.</i>	Intraoral Digital Impression Technique: A Review. - PDF ... https://docksci.com/intraoral-digital-impression-technique-a-review_5a920f80d64ab25e83692507.html	Originality
346.	<i>Straumann applies implant components according to CAD software DWOS.</i>	Intraoral Digital Impression Technique: A Review. - PDF ... https://docksci.com/intraoral-digital-impression-technique-a-review_5a920f80d64ab25e83692507.html	Originality
347.	<i>It uses red laser as a light source and</i>	3D impressions in prosthodontics - LinkedIn SlideShare https://www.slideshare.net/SiripurapuSravani/3d-impressions-in-	Originality

		prosthodontics	
348.	<i>digital impression data can be used by other CAD/CAM systems.</i>	3D impressions in prosthodontics - LinkedIn SlideShare https://www.slideshare.net/SiripurapuSravani/3d-impressions-in-prosthodontics	Originality
349.	<i>A quick scanning speed of up to 3000 images per second reduces the</i>	3D impressions in prosthodontics - LinkedIn SlideShare https://www.slideshare.net/SiripurapuSravani/3d-impressions-in-prosthodontics	Originality
350.	<i>IOS FastScan – by IOS TECHNOLOGIES, INC.5. (US</i>	(PDF) A Comparative Analysis of Intraoral 3d Digital ... https://www.researchgate.net/publication/284284335_A_Comparative_Analysis_of_Intraoral_3d_Digital_Scanners_for_Restorative_Dentistry	Originality
351.	<i>This system works on the principle of "active</i>	Mathematical modeling of the electric drive train of the ... http://www.posterus.sk/?p=13578	Originality
352.	<i>sweeps a sheet of light across one or more surfaces of teeth, where the sheet of light projector and imaging aperture within the scanner probe rapidly moves back and forth along all or part of the full scan path, and</i>	(PDF) A Comparative Analysis of Intraoral 3d Digital ... https://www.researchgate.net/publication/284284335_A_Comparative_Analysis_of_Intraoral_3d_Digital_Scanners_for_Restorative_Dentistry	Originality
353.	<i>real-time, live 3D preview of the digital 3D model of the scanned</i>	(PDF) A Comparative Analysis of Intraoral 3d Digital ... https://www.researchgate.net/publication/284284335_A_Comparative_Analysis_of_Intraoral_3d_Digital_Scanners_for_Restorative_Dentistry	Originality
354.	<i>combined in a single digital prescription, which is electronically transferred to a laboratory or CAD/CAM system for fabrication.</i>	US20090133260A1 - 3D dental shade matching and apparatus ... https://patents.google.com/patent/US20090133260A1/en	Originality

355.	<i>and the most accurate and robust wand in the market, with full interproximal scan coverage.</i>	(PDF) A Comparative Analysis of Intraoral 3d Digital ... https://www.researchgate.net/publication/284284335_A_Comparative_Analysis_of_Intraoral_3d_Digital_Scanners_for_Restorative_Dentistry	Originality
356.	<i>Minimize the effect of movement of the patient, the practitioner, and the apparatus, during the procedure of 3D intra-oral imaging. DPI - 3D BY DIMENSIONAL PHOTONICS INTERNATIONAL, INC. (US</i>	(PDF) A Comparative Analysis of Intraoral 3d Digital ... https://www.researchgate.net/publication/284284335_A_Comparative_Analysis_of_Intraoral_3d_Digital_Scanners_for_Restorative_Dentistry	Originality
357.	<i>MHT Optic Research AG and MHT S.P.A.</i>	(PDF) A Comparative Analysis of Intraoral 3d Digital ... https://www.researchgate.net/publication/284284335_A_Comparative_Analysis_of_Intraoral_3d_Digital_Scanners_for_Restorative_Dentistry	Originality
358.	<i>A smart Pixel Sensor that enables fast and accurate scanning,</i>	(PDF) A Comparative Analysis of Intraoral 3d Digital ... https://www.researchgate.net/publication/284284335_A_Comparative_Analysis_of_Intraoral_3d_Digital_Scanners_for_Restorative_Dentistry	Originality
359.	<i>3D Progress works as a confocal microscope combined with</i>	(PDF) A Comparative Analysis of Intraoral 3d Digital ... https://www.researchgate.net/publication/284284335_A_Comparative_Analysis_of_Intraoral_3d_Digital_Scanners_for_Restorative_Dentistry	Originality
360.	<i>Software includes a virtual articulator and allows the</i>	(PDF) A Comparative Analysis of Intraoral 3d Digital ... https://www.researchgate.net/publication/284284335_A_Comparative_Analysis_of_Intraoral_3d_Digital_Scanners_for_Restorative_Dentistry	Originality

361.	<i>Digital impressions are easier to store because they do not take up space.</i>	Digital Impressions - Clinical Applications of Digital ... https://onlinelibrary.wiley.com/doi/10.1002/9781119045564.ch2	Originality
362.	<i>Mormann WH: The evolution of the CEREC system. J Am Dent Assoc 2006;137:</i>	Intraoral Digital Impression Technique: A Review. - PDF ... https://docksci.com/intraoral-digital-impression-technique-a-review_5a920f80d64ab25e83692507.html	Originality
363.	<i>Ender A, Mehl A. Full arch scans: conventional versus digital</i>	Intraoral Digital Impression Technique: A Review. - PDF ... https://docksci.com/intraoral-digital-impression-technique-a-review_5a920f80d64ab25e83692507.html	Originality
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Implant Navigation System

by MIDSAR Dental

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2,609

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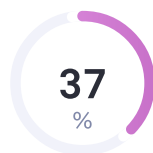
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59	Clarity	
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22	Word choice	
41	Correctness	
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11	Punctuation in compound/complex sentences	
17	Improper formatting	
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Implant Navigation System

Implant Navigation System: Novel Approach - A Review Article

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Abstract: Dental implant technology has been widely used¹ for oral reconstruction in recent years. Dental implants provide an alternative

treatment for patients who are unsatisfied with traditional partial or full mouth dentures. Well-fabricated dental implant prosthesis depends on the appropriate placement of the implant, a prosthetic-driven concept that explains the importance of the implant placement, angle, and direction.²

Freehand methods for placement of implant result in significantly more error compared with navigation methods. Dental implant navigation systems are auxiliary systems that are useful for implantations. These systems depend on medical imaging technology in combination with optical positioning. Navigation systems can prevent damage to nerves or critical structures of adjacent teeth by improving safety measures during surgical procedures.³ Dentists can develop a precise plan for dental implants by using this system, according to preoperatively derived data, which helps in increasing the accuracy of dental implants and reducing the risk of dental implant failure. Using dental implant navigation systems can assist dentists in offering high-quality and safe implant services to patients. Also, the navigation system provides accuracy according to the operation site and time. Various guidance techniques have emerged that transfer the planned digital information to the clinical settings. Some of the methods available are computer-guided (static) implant surgery and computer navigated (dynamic) implant surgery and robotic implant dentistry. Thus, the review article explains the use of implant navigation systems for precision-driven implant placement and final prosthesis.⁴

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Keywords: Navigation systems, Dental implants, Surgical guide, computerized navigation surgery.

INTRODUCTION

Dental implants have become an acceptable treatment option to replace lost teeth. It is an alternative treatment for dental bridges and partial denture rehabilitation.¹ Well-fabricated dental implant prosthesis depends on the appropriate implant placement, direction, and angle. It also depends on a prosthetic-driven concept that highlights the importance of implant placement.² However, one may face several challenges during implant placement like restricted access to the surgical field, use of local anesthesia for a limited period, and transfer of the radiographic image to the surgical procedure. Dental implants must position accurately to support restorations that aesthetically and functionally align with adjacent and occluding dentition.³

A reliable computer-aided intraoperative navigation system allows accurate transfer of the preoperative plan to the patient and enables⁵ the surgeon to minimize surgical exposure, which results in less morbidity and less bone resorption.⁴ Pre-surgical planning with the use of a surgical guide during the dental implant placement is, therefore, encouraged.⁵ Computerized navigation surgery is a surgical modality in which the instruments are accurately tracked⁶ and targeted to a pre-planned location within the surgical field. This is based⁷ on the synchronization of the intraoperative position of the instruments with⁸ the imaging of the patient's anatomy previously obtained by computed⁹ tomography (CT) or magnetic resonance imaging (MRI).¹⁰ Computer-assisted surgical implant placement (CAS) systems are commonly employed¹¹ for improving accuracy in dental implant placement.⁷ These can be categorized¹² into static or dynamic. Static systems¹³ use guides fabricated with computer-aided design/computer-aided manufacturing (CAD/CAM) based on three-dimensional scans. In contrast, a dynamic system tracks the patient, surgical

instruments and presents real-time positional and guidance feedback on a display of computer.⁸¹⁴

The specific aim of this study was to create and evaluate a surgical navigation system that would be user friendly for the surgeon.⁹ The overall accuracy takes into consideration¹⁵ the precision of the surgical navigation system, the precision of the surgical instruments, and the surgeon's skill.

Computer navigated implant system¹⁷

¹²⁵ Image-guided surgery¹⁸, also known as surgical navigation guidance, has recently been introduced to implant dentistry.¹⁰ They may be advantageous compared to conventional surgical protocols when it comes to patients with limited¹⁹ amount of bone.²⁰¹¹ The computer navigated implant system is ¹²⁶ empowered by a motion-tracking technology, which²¹ tracks the dental drill and patient position throughout the implant placement procedures by integrating surgical instruments, three-dimensional images, and optical positioning devices. Computer navigated implant surgery is the placement of an implant using a real-time computer navigated system based on the data generated from the patient's cone-beam computed tomography (CBCT).³

Static Guide

¹²⁷ "Template-based system," that communicates predetermined sites using surgical templates in the operating field, manufactured via rapid prototyping technologies such as three-dimensional printing and stereolithography.¹² Fabrication of the imaging guide requires laboratory work before scanning, which will necessitate time delays and additional cost to the team which²² is added cost²³ to the patient. Digital methods might eliminate the need for a laboratory-based imaging guide in the future. It is a Computer Navigated static

system that uses CT-generated computer-aided design and computer-aided manufacturing (CAD-CAM) to create stents using metal tubes and a surgical ²⁴ system to place implants using the guide stent. The implant position is dependent on the stent ²⁵ and its use is abandoned ²⁶ during the surgical procedure.

No intra-operative position changes can ²⁷ be made unless to fabricate a CT-generated surgical guide for static navigation, a cone-beam CT scan (CBCT) ²⁸ is taken with the prosthetic plan in the mouth as an imaging guide.

The CBCT Digital Imaging and Communications in Medicine (DICOM) data must ²⁹ be entered into the CT planning software. It requires training to use CT planning software. Many clinicians will not learn the software proficiently and use a third party to plan the case. After the team has finalized the plan, it will ³ be uploaded to the stent manufacturer. ³¹ An optical scan of the arch is needed to fabricate a ³² guide which will seat accurately on the teeth. This requires impressions, pouring stone, and trimming the model. All these requirements add time and costs to the static guide method. The manufacturer will evaluate the uploaded scan and check whether it meets the quality control parameters. The clinician might need to repeat all the process if the static guide does not seat accurately on the teeth or tissues. The period between uploading guide stent and delivery can require ³³ 2 weeks.

Once the guide stent has ³⁴ been delivered, the ¹⁸ surgery can ³⁵ be performed. The cost of CT-generated static guides will differ between manufacturers. These require preoperative procedures ³⁶ and their added ³⁷ cost, combined with the clinician's reluctance to gain proficiency with the planning software, creates a workflow barrier for ³⁸ the use of static CT-generated guides.¹³ The ³⁹ static navigation surgery can ⁴⁰ be classified according to the type of ⁴¹ the guide support, the type of surgical visibility, and the type of drilling and implant placement facility.¹⁴

Advantages¹³:

- 1) Accurate implant placement
- 2) It uses a flapless approach
- 3) It requires less-invasive surgery¹⁸, which results in less patient morbidity.
- 4) It is used⁴² preoperatively to fabricate fixed provisional restorations.

Drawbacks¹⁵:

1. Incorrect processing of the image
- 138 2. Deviations from planned implant positions especially⁴³ in the coronal and apical portions of the implants as well as with implant angulation
- 139 3. Inaccurate fixation of the guide resulting in displacement during perforation
- 140 4. Mechanical errors caused by angulation of the drills during perforation
5. Reduced mouth opening changes the positioning of surgical instruments
6. Fracture of the surgical guide
7. The complexity of the whole system
- 141 8. The total cost of tools needed including the software program and surgical templates
- 142 9. The potential for thermal injury secondary to reduced access for external irrigation during⁴⁴ the preparation⁴⁴ of the osteotomy procedure during flapless implant placement with⁴⁵ surgical guides.
- 143 10. Does not allow intraoperative modification of implant position.⁴⁶

Dynamic Guide

144 Computer-assisted dynamic navigation system involves the use of⁴⁷ a surgical navigation system that reproduces a virtual implant position directly from CT data with the optical bur tracking system without the requirement of an intraoral surgical guide.

145 The optical systems use either active or passive tracking arrays. Active⁴⁸ system arrays emit light which⁴⁹ is tracked by the stereo cameras. Passive systems use tracking⁵⁰ systems in which the light emitted from a light source is reflected in the stereo cameras. A passive optical dynamic navigation system requires the⁵¹ use of fiducial markers securely attached to the patient's arch during CBCT scanning. The device attached to the fiducial markers⁵² allows for the⁵³ registration of the arch to the cameras, with the attachment of an array.⁵⁵ The array is positioned⁵⁶ extra orally which⁵⁷ contains the fiducial markers.⁵⁸ The implant hand-piece also has an array which is a combination of the clip's fiducial⁵⁹ markers,⁶⁰ allows for triangulation leading to accurate navigation.⁶¹3

Dynamic navigation is the real-time coordination of the surgeon's hands and eyes by 3-dimensional (3D) visualization of the preparation with high magnification.¹⁶ The basic⁶² components of any dynamic navigation system are the hand-piece attachment, patient jaw attachment, and the system cart which⁶³ consists of the cameras, a computer with navigation software. Natural or fiducial markers are used⁶⁴ during the radiological scan as reference points for the instrument registration. To guide the drilling⁶⁵, the navigation system must precisely map the drill tip to the CT image of the jaw used for planning the implantation. Sensors are attached to the body of the hand-piece and the extra-oral clip attached to the fiducial markers. It achieves this in three steps, performed in the following order³⁻

1. Registration: Mapping the extra-oral clip to the CT image. The physical space⁶⁶ coordinates of the patient have to be linked to the patient's image coordinates,

a process called registration.⁶⁷

151 2. Calibration: Mapping the drill tip to the body of the hand-piece. The drilling
 152 axis calibration is done once before the start of the Surgery and the drill tip
 location is calibration is done after each drill change.⁶⁹

153 3. Tracking: Mapping the body of the hand-piece to the extra-oral clip. This is
 dynamic and is done throughout the operation by the optical tracking system.⁷⁰

Workflow3:

155 1. Securing the fiducial markers to the arch in an area that will not undergo
surgery.¹⁸

2. The CBCT scan should be taken with the clip in place, removed, and stored
 for use during
the surgery.^{71 18,72}

3. The DICOM (Digital Imaging and Communication in Medicine) data set is
loaded into the⁷³

156 navigation systems computer followed by the placement of the virtual implant.^{74 75 71}

The
 implants are generically generated using the platform diameter and length in
 0.1mm
 increments with required orientation.⁷⁷

4. During the surgery, the fiducial marker is attached to an array and the clip
with the^{18 78 79}

attached array should be registered to the Navigation system. The surgeon can
use^{80 81 82 83}

traditional anesthesia and small incisions with minimal flap reflections.⁸⁴

- 157 5. The clip array should be securely repositioned⁸⁵ on to the arch and⁸⁶ the drill lengths should⁸⁷ be registered⁸⁸ during the preparation process.
- 158 6. The surgeon then positions the patient and arrays for a direct line of sight to the⁸⁹ overhead⁹⁰ cameras. The drills must be oriented by the 3D images on the screen.⁹¹
- 159 7. The implant can be placed⁹¹ fully or partially guided by hand depending on the clinician's preference.

Indications¹³:

1. Patients with limited mouth opening.
2. Difficult to access areas such as the second molar.
3. Implant placement in tight interdental spaces when static guides cannot be⁹² used⁹³ owing to⁹⁴ the⁹⁵ tube size.
4. Implant placement when⁹⁴ direct visualization is difficult.
5. Implant placement on the same day of the CBCT scan.

160 6. Implant placement adjacent to natural teeth in situations in which static guide tubes⁹⁵ interfere⁹⁶ with ideal implant placement.

161 Advantages:

1. The patient can be scanned, planned, and undergo surgery¹⁸ on the same day.

162 2. The entire field can be visualized⁹⁶ at all times.

3. Accuracy can be verified⁹⁷ at all times.

163 4. The plans can be altered during surgery¹⁸ when clinical situations dictate a change.

Disadvantages3:

1. Increased pre-surgical planning
2. Higher costs
3. Size of the system
4. Technical issues

Conclusion

164 As the experience of the clinician and their surgical proficiency increases, the use of the dynamic method might predominate, because of the time- and cost-efficient workflow.⁹⁸ In dentate patients, dynamic navigation requires the presence of teeth to stabilize the registration clip and array. The registration and clip array should not be placed⁹⁹ on temporarily cemented provisional restorations or mobile teeth¹⁰⁰. Also, the placement of implants in molar locations with difficult direct visual access occurs in patients with a limited mouth opening or crestal bone loss¹⁰¹, resulting in the need for drill extenders.¹⁰²

165 Placement of adjacent implants requires accurate spacing between the implants and adjacent teeth.

166 Static or dynamic systems can each be used¹⁰³; however, the selection will depend on clinician experience and case-specific considerations. In the Static system, the choice of an implant cannot be easily changed¹⁰⁴ once the CT guide stent has been fabricated¹⁰⁵.^{106 107} Thus, the implant position cannot be changed unless the surgeon abandons the use of the CT guide stent.¹⁰⁸ Dynamic navigation is flexible, allowing the clinician to change¹⁰⁹ the surgical plan as the clinical situation dictates. It also requires no laboratory work, thus¹¹⁰ allowing for

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169 immediate scanning, planning, and guidance on the same day as patient presentation. The clinician must understand that a learning curve is required to gain proficiency. ¹¹¹ This could require additional time for training, simulation, and practice on mankind.¹¹²

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Accurate

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techniques of

static/dynamic¹²² guided implant surgery: modalities and indications. Periodont¹²³
2000.

2014;66:214–27.

1.	<i>been widely used</i>	Passive Voice Misuse	Clarity
2.		Intricate Text	Clarity
3.		Intricate Text	Clarity
4.	the use of	Wordy Sentences	Clarity
5.	and enables → . It enables	Hard-to-read text	Clarity
6.	<i>are accurately tracked</i>	Passive Voice Misuse	Clarity
7.	<i>This</i>	Intricate Text	Clarity
8.	<i>is based</i>	Passive Voice Misuse	Clarity
9.	instruments → devices, tools, apparatus	Word Choice	Engagement
10.		Intricate Text	Clarity
11.	<i>are commonly employed</i>	Passive Voice Misuse	Clarity
12.	<i>be categorized</i>	Passive Voice Misuse	Clarity
13.	systems → methods	Word Choice	Engagement
14.	computer.8.	Closing Punctuation	Correctness
15.	considers	Wordy Sentences	Clarity
16.	precision → correctness	Word Choice	Engagement
17.	system.	Closing Punctuation	Correctness
18.	<i>surgery; Surgery</i>	Text Inconsistencies	Correctness
19.	a limited	Determiner Use (a/an/the/this, etc.)	Correctness
20.		Intricate Text	Clarity

21.	, which → that	Wordy Sentences	Clarity
22.	, which	Punctuation in Compound/Complex Sentences	Correctness
23.	cost → value, price	Word Choice	Engagement
24.	system → operation, method	Word Choice	Engagement
25.	, and	Punctuation in Compound/Complex Sentences	Correctness
26.	<i>is abandoned</i>	Passive Voice Misuse	Clarity
27.	<i>be made</i>	Passive Voice Misuse	Clarity
28.	<i>is taken</i>	Passive Voice Misuse	Clarity
29.	<i>be entered</i>	Passive Voice Misuse	Clarity
30.	<i>be uploaded</i>	Passive Voice Misuse	Clarity
31.		Intricate Text	Clarity
32.	<i>This</i>	Intricate Text	Clarity
33.	2 → two	Improper Formatting	Correctness
34.	<i>been delivered</i>	Passive Voice Misuse	Clarity
35.	<i>be performed</i>	Passive Voice Misuse	Clarity
36.	, and	Punctuation in Compound/Complex Sentences	Correctness
37.	cost → value	Word Choice	Engagement
38.	the use of	Wordy Sentences	Clarity
39.	static → immobile	Word Choice	Engagement

40.	<i>be classified</i>	Passive Voice Misuse	Clarity
41.	the guide	Determiner Use (a/an/the/this, etc.)	Correctness
42.	<i>is used</i>	Passive Voice Misuse	Clarity
43.	especially → primarily, mainly	Word Choice	Engagement
44.	during the → during the	Improper Formatting	Correctness
45.	with surgical	Improper Formatting	Correctness
46.	<i>Does not allow intraoperative modification of implant position.</i>	Incomplete Sentences	Correctness
47.	the use of → using	Wordy Sentences	Clarity
48.	Active → Dynamic	Word Choice	Engagement
49.	, which	Punctuation in Compound/Complex Sentences	Correctness
50.	tracking → monitoring	Word Choice	Engagement
51.	the use of	Wordy Sentences	Clarity
52.	attached → connected	Word Choice	Engagement
53.	markers → tags, bookmarks	Word Choice	Engagement
54.	arch → span	Word Choice	Engagement
55.		Intricate Text	Clarity
56.	<i>is positioned</i>	Passive Voice Misuse	Clarity
57.	, which	Punctuation in Compound/Complex Sentences	Correctness
58.	markers → tags	Word Choice	Engagement

59.	an array → a range, a collection, a display	Word Choice	Engagement
60.	markers → tags	Word Choice	Engagement
61.		Intricate Text	Clarity
62.	basic → essential, necessary	Word Choice	Engagement
63.	, which	Punctuation in Compound/Complex Sentences	Correctness
64.	are used	Passive Voice Misuse	Clarity
65.	To guide the drilling	Misplaced Words or Phrases	Correctness
66.	be linked	Passive Voice Misuse	Clarity
67.		Intricate Text	Clarity
68.	, and	Punctuation in Compound/Complex Sentences	Correctness
69.	is done	Passive Voice Misuse	Clarity
70.	This	Intricate Text	Clarity
71.	during the → during the	Improper Formatting	Correctness
72.	surgery → operation	Word Choice	Engagement
73.	is loaded	Passive Voice Misuse	Clarity
74.	the navigation	Improper Formatting	Correctness
75.	computer,	Punctuation in Compound/Complex Sentences	Correctness
76.		Intricate Text	Clarity
77.	are generically generated	Passive Voice Misuse	Clarity

78.	<i>is attached</i>	Passive Voice Misuse	Clarity
79.	, and	Punctuation in Compound/Complex Sentences	Correctness
80.	the attached → the attached	Improper Formatting	Correctness
81.	array → collection, display, range	Word Choice	Engagement
82.	<i>be registered</i>	Passive Voice Misuse	Clarity
83.	<i>During the surgery, the fiducial marker is attached to an array and the clip with the attached array should be registered to the Navigation system.</i>	Intricate Text	Clarity
84.	use traditional	Improper Formatting	Correctness
85.	<i>be securely repositioned</i>	Passive Voice Misuse	Clarity
86.	, and	Punctuation in Compound/Complex Sentences	Correctness
87.	should be → should be	Improper Formatting	Correctness
88.	<i>be registered</i>	Passive Voice Misuse	Clarity
89.	the overhead → the overhead	Improper Formatting	Correctness
90.		Passive Voice Misuse	Clarity
91.	<i>be placed</i>	Passive Voice Misuse	Clarity
92.	<i>be used</i>	Passive Voice Misuse	Clarity
93.	to the → to the	Improper Formatting	Correctness
94.	, when	Punctuation in Compound/Complex Sentences	Correctness
95.	tubes interfere	Improper Formatting	Correctness

96.	<i>be visualized</i>	Passive Voice Misuse	Clarity
97.	<i>be verified</i>	Passive Voice Misuse	Clarity
98.		Intricate Text	Clarity
99.	<i>be placed</i>	Passive Voice Misuse	Clarity
100.	mobile → loose	Word Choice	Engagement
101.	<i>crestal</i>	Unknown Words	Correctness
102.		Intricate Text	Clarity
103.	<i>be used</i>	Passive Voice Misuse	Clarity
104.	system → order	Word Choice	Engagement
105.	<i>be easily changed</i>	Passive Voice Misuse	Clarity
106.	<i>been fabricated</i>	Passive Voice Misuse	Clarity
107.		Intricate Text	Clarity
108.		Intricate Text	Clarity
109.	change → adjust, improve	Word Choice	Engagement
110.	thus	Wordy Sentences	Clarity
111.	<i>This</i>	Intricate Text	Clarity
112.	mankind → humanity, humankind	Potentially Sensitive Language	Delivery
113.	surgery future	Improper Formatting	Correctness
114.	the accuracy	Determiner Use (a/an/the/this, etc.)	Correctness
115.	of endosseous	Improper Formatting	Correctness

116.	implant placement	Improper Formatting	Correctness
117.	Model-Based → Model-Based	Misspelled Words	Correctness
118.	maxillofacial surgery	Improper Formatting	Correctness
119.	Jabero → Jaber	Misspelled Words	Correctness
120.	computerguided → computer guided, computer-guided	Misspelled Words	Correctness
121.	implant placement	Improper Formatting	Correctness
122.	ef static → of static	Improper Formatting	Correctness
123.	Periodont → Periodontal	Misspelled Words	Correctness
124.	<i>Various guidance techniques have emerged that transfer the planned digital information to</i>	Dynamic Implant Navigation Systems: A Review https://www.wjasr.in/uploads/150/5850_pdf.pdf	Originality
125.	<i>Image-guided surgery, also known as surgical navigation guidance, has recently been introduced to implant dentistry.</i>	Advanced Surgical Guidance Technology: A Review : Implant ... https://journals.lww.com/implantdent/Fulltext/2006/06000/Advanced_Surgical_Guidance_Technology__A_Review.6.aspx	Originality
126.	<i>technology, which tracks the dental drill and patient position throughout the implant placement procedures by integrating surgical instruments, three-dimensional images, and optical positioning devices.</i>	Dynamic Implant Navigation Systems: A Review https://www.wjasr.in/uploads/150/5850_pdf.pdf	Originality
127.	<i>Template-based system," that communicates predetermined sites using surgical templates</i>	OPEN ACCESS Short Communication Navigation in Implant ... https://www.econicon.com/ecde/pdf/ECDE-14-00484.pdf	Originality
128.	<i>The implant position is dependent on the stent</i>	MASTERING DENTAL IMPLANT PLACEMENT: A REVIEW	Originality

https://www.joadms.org/admin/sets/article_issue/22072017_22/1509162830.pdf

129.	<i>for static navigation, a cone-beam CT scan (CBCT) is taken with the prosthetic plan in the mouth as an imaging guide.</i>	Static or Dynamic Navigation for Implantation-Choosing the ... https://www.ccomfs.com/wp-content/uploads/2018/04/Static-or-Dynamic-Navigation-for-Implant-Placement.pdf	Originality
130.	<i>The CBCT Digital Imaging and Communications in Medicine (DICOM) data must be entered into the CT planning software.</i>	Static or Dynamic Navigation for Implantation-Choosing the ... https://www.ccomfs.com/wp-content/uploads/2018/04/Static-or-Dynamic-Navigation-for-Implant-Placement.pdf	Originality
131.	<i>software. Many clinicians will not learn the software proficiently and</i>	Static or Dynamic Navigation for Implantation-Choosing the ... https://www.ccomfs.com/wp-content/uploads/2018/04/Static-or-Dynamic-Navigation-for-Implant-Placement.pdf	Originality
132.	<i>An optical scan of the arch is needed to fabricate a guide</i>	Static or Dynamic Navigation for Implantation-Choosing the ... https://www.ccomfs.com/wp-content/uploads/2018/04/Static-or-Dynamic-Navigation-for-Implant-Placement.pdf	Originality
133.	<i>will seat accurately on the teeth. This requires impressions, pouring stone, and trimming the model. All these</i>	Static or Dynamic Navigation for Implantation-Choosing the ... https://www.ccomfs.com/wp-content/uploads/2018/04/Static-or-Dynamic-Navigation-for-Implant-Placement.pdf	Originality
134.	<i>method. The manufacturer will evaluate the uploaded scan and</i>	Static or Dynamic Navigation for Implantation-Choosing the ... https://www.ccomfs.com/wp-content/uploads/2018/04/Static-or-Dynamic-Navigation-for-Implant-Placement.pdf	Originality
135.	<i>can require 2 weeks. Once the guide</i>	Static or Dynamic Navigation for	Originality

	<i>stent has been delivered, the surgery can be performed. The cost</i>	Implancement-Choosing the ... https://www.ccomfs.com/wp-content/uploads/2018/04/Static-or-Dynamic-Navigation-for-Implant-Placement.pdf	
136.	<i>guides will differ between manufacturers. These require preoperative procedures and their added cost, combined with the clinician's reluctance to gain</i>	Static or Dynamic Navigation for Implancement-Choosing the ... https://www.ccomfs.com/wp-content/uploads/2018/04/Static-or-Dynamic-Navigation-for-Implant-Placement.pdf	Originality
137.	<i>with the planning software, creates a workflow barrier for the use of static CT-generated guides.</i>	Static or Dynamic Navigation for Implancement-Choosing the ... https://www.ccomfs.com/wp-content/uploads/2018/04/Static-or-Dynamic-Navigation-for-Implant-Placement.pdf	Originality
138.	<i>Deviations from planned implant positions especially in the coronal and apical portions of the implants as well as with implant angulation</i>	OPEN ACCESS Short Communication Navigation in Implant ... https://www.ecronicon.com/ecde/pdf/ECDE-14-00484.pdf	Originality
139.	<i>Inaccurate fixation of the guide resulting in displacement during perforation</i>	OPEN ACCESS Short Communication Navigation in Implant ... https://www.ecronicon.com/ecde/pdf/ECDE-14-00484.pdf	Originality
140.	<i>Mechanical errors caused by angulation of the drills during perforation</i>	OPEN ACCESS Short Communication Navigation in Implant ... https://www.ecronicon.com/ecde/pdf/ECDE-14-00484.pdf	Originality
141.	<i>The total cost of tools needed including the software program and surgical templates</i>	OPEN ACCESS Short Communication Navigation in Implant ... https://www.ecronicon.com/ecde/pdf/ECDE-14-00484.pdf	Originality
142.	<i>The potential for thermal injury secondary to reduced access for external irrigation during</i>	OPEN ACCESS Short Communication Navigation in Implant ...	Originality

		https://www.ecronicon.com/ecde/pdf/ECDE-14-00484.pdf	
143.	<i>Does not allow intraoperative modification of implant position.</i>	OPEN ACCESS Short Communication Navigation in Implant ... https://www.ecronicon.com/ecde/pdf/ECDE-14-00484.pdf	Originality
144.	<i>virtual implant position directly from CT data with the optical bur tracking system without the requirement of an intraoral surgical guide.</i>	OPEN ACCESS Short Communication Navigation in Implant ... https://www.ecronicon.com/ecde/pdf/ECDE-14-00484.pdf	Originality
145.	<i>The optical systems use either active or passive tracking arrays. Active system arrays emit light which is tracked by the stereo cameras. Passive systems use tracking systems in which the light emitted from a light source is reflected</i>	Dynamic Implant Navigation Systems: A Review https://www.wjasr.in/uploads/150/5850_pdf.pdf	Originality
146.	<i>the stereo cameras. A passive optical dynamic navigation system requires the use of fiducial markers securely attached to the patient's arch during CBCT scanning. The device attached to the fiducial markers allows for the registration of the arch to the cameras, with the attachment of an array. The...</i>	Dynamic Implant Navigation Systems: A Review https://www.wjasr.in/uploads/150/5850_pdf.pdf	Originality
147.	<i>attachment, patient jaw attachment, and the system cart which consists of the cameras, a computer with</i>	Dynamic Implant Navigation Systems: A Review https://www.wjasr.in/uploads/150/5850_pdf.pdf	Originality
148.	<i>navigation system must precisely map the drill tip to the CT image of the jaw used for planning the implantation. Sensors are attached</i>	Dynamic Implant Navigation Systems: A Review https://www.wjasr.in/uploads/150/5850_pdf.pdf	Originality
149.	<i>clip attached to the fiducial markers. It achieves this in three steps, performed in the following</i>	Dynamic Implant Navigation Systems: A Review https://www.wjasr.in/uploads/150/5850_pdf.pdf	Originality

150.	<i>2. Calibration: Mapping the drill tip to the body of the</i>	Dynamic Implant Navigation Systems: A Review https://www.wjasr.in/uploads/150/5850_pdf.pdf	Originality
151.	<i>The drilling axis calibration is done once before the start of the</i>	Dynamic Implant Navigation Systems: A Review https://www.wjasr.in/uploads/150/5850_pdf.pdf	Originality
152.	<i>the drill tip location is calibration is done after each drill change. 3. Tracking: Mapping the body of the</i>	Dynamic Implant Navigation Systems: A Review https://www.wjasr.in/uploads/150/5850_pdf.pdf	Originality
153.	<i>clip. This is dynamic and is done throughout the operation by the optical tracking system.</i>	Dynamic Implant Navigation Systems: A Review https://www.wjasr.in/uploads/150/5850_pdf.pdf	Originality
154.	<i>1. Securing the fiducial markers to the arch in an area</i>	Dynamic Implant Navigation Systems: A Review https://www.wjasr.in/uploads/150/5850_pdf.pdf	Originality
155.	<i>will not undergo surgery. 2. The CBCT scan should be taken with the clip in place, removed, and stored for use during the surgery. 3. The DICOM (Digital Imaging and Communication in Medicine) data set is loaded into the navigation systems computer followed by</i>	Dynamic Implant Navigation Systems: A Review https://www.wjasr.in/uploads/150/5850_pdf.pdf	Originality
156.	<i>virtual implant. The implants are generically generated using the platform diameter and length in 0.1mm increments with required orientation. 4. During the surgery, the fiducial marker is attached to an array and the clip with the attached array should be registered to the Navigation...</i>	Dynamic Implant Navigation Systems: A Review https://www.wjasr.in/uploads/150/5850_pdf.pdf	Originality
157.	<i>The clip array should be securely</i>	Dynamic Implant Navigation	Originality

	<i>repositioned on to the arch and the drill lengths should be registered during the preparation process.</i>	Systems: A Review https://www.wjasr.in/uploads/150/5850_pdf.pdf	
158.	<i>The surgeon then positions the patient and arrays for</i>	Dynamic Implant Navigation Systems: A Review https://www.wjasr.in/uploads/150/5850_pdf.pdf	Originality
159.	<i>The implant can be placed fully or partially guided by hand depending on the clinician's</i>	Dynamic Implant Navigation Systems: A Review https://www.wjasr.in/uploads/150/5850_pdf.pdf	Originality
160.	<i>6. Implant placement adjacent to natural teeth in situations in which static guide tubes interfere with ideal implant placement.</i>	Dynamic Implant Navigation Systems: A Review https://www.wjasr.in/uploads/150/5850_pdf.pdf	Originality
161.	<i>Advantages: 1. The patient can be scanned, planned, and undergo surgery on the same day. 2. The</i>	Accuracy of Dynamic Navigation for Dental Implant ... https://meridian.allenpress.com/joi/article/42/5/399/2471/Accuracy-of-Dynamic-Navigation-for-Dental-Implant	Originality
162.	<i>entire field can be visualized at all times.</i>	Study finds accuracy of X-Guide™ Navigation is 11 times ... https://implantpracticeus.com/industry-news/technology/study-finds-accuracy-x-guide-navigation-11-times-better-freehand-implant-placement/	Originality
163.	<i>The plans can be altered during surgery when clinical situations dictate a change.</i>	Study finds accuracy of X-Guide™ Navigation is 11 times ... https://implantpracticeus.com/industry-news/technology/study-finds-accuracy-x-guide-navigation-11-times-better-freehand-implant-placement/	Originality
164.	<i>and their surgical proficiency increases, the use of the dynamic method might predominate, because of the time- and cost-efficient workflow. In dentate patients,</i>	Static or Dynamic Navigation for Implantation-Choosing the ... https://www.ccomfs.com/wp-content/uploads/2018/04/Static-	Originality

	<i>dynamic navigation requires the presence of teeth to stabilize the registration clip and array. The registration and clip array should no...</i>	or-Dynamic-Navigation-for-Implant-Placement.pdf	
165.	<i>placement of implants in molar locations with difficult direct visual access occurs in patients with a limited mouth opening or crestal bone loss,</i>	Static or Dynamic Navigation for Implantation-Choosing the ... https://www.ccomfs.com/wp-content/uploads/2018/04/Static-or-Dynamic-Navigation-for-Implant-Placement.pdf	Originality
166.	<i>in the need for drill extenders. Placement of adjacent implants requires accurate spacing between the implants and adjacent teeth. Static or dynamic systems can each be used; however, the selection will depend on clinician experience and</i>	Static or Dynamic Navigation for Implantation-Choosing the ... https://www.ccomfs.com/wp-content/uploads/2018/04/Static-or-Dynamic-Navigation-for-Implant-Placement.pdf	Originality
167.	<i>Dynamic navigation is flexible, allowing the clinician to change the surgical plan as the clinical situation</i>	Static or Dynamic Navigation for Implantation-Choosing the ... https://www.ccomfs.com/wp-content/uploads/2018/04/Static-or-Dynamic-Navigation-for-Implant-Placement.pdf	Originality
168.	<i>thus allowing for immediate scanning, planning, and guidance on the same day as patient presentation. The clinician must understand that a learning curve is required to gain</i>	Static or Dynamic Navigation for Implantation-Choosing the ... https://www.ccomfs.com/wp-content/uploads/2018/04/Static-or-Dynamic-Navigation-for-Implant-Placement.pdf	Originality
169.	<i>This could require additional time for training, simulation, and practice on</i>	Static or Dynamic Navigation for Implantation-Choosing the ... https://www.ccomfs.com/wp-content/uploads/2018/04/Static-or-Dynamic-Navigation-for-Implant-Placement.pdf	Originality
170.	<i>Computerized Navigation for Immediate Loading of Dental Implants with a Prefabricated Metal Frame: A Feasibility Study. J Oral Maxillofac Surg.</i>	Static or Dynamic Navigation for Implantation-Choosing the ... https://www.ccomfs.com/wp-content/uploads/2018/04/Static-or-Dynamic-Navigation-for-Implant-Placement.pdf	Originality

		or-Dynamic-Navigation-for-Implant-Placement.pdf	
171.	<i>Sun TM, Lan TH, Pan CY, Lee HE. Dental implant navigation system guide the surgery future.</i>	Dynamic Implant Navigation Systems: A Review https://www.wjasr.in/uploads/150/5850_pdf.pdf	Originality
172.	<i>Emery RW, Merritt SA, Lank K, Gibbs JD. Accuracy of Dynamic Navigation for Dental Implant Placement - Model Based Evaluation. J Oral Implantol. 2016</i>	FOR DENTAL IMPLANT PLACEMENT https://x-navtech.com/wp-content/uploads/2019/10/x-guide_accuracy.pdf	Originality
173.	<i>Hultin M, Svensson KG, Trulsson M. Clinical advantages of</i>	Static or Dynamic Navigation for Implancement-Choosing the ... https://www.ccomfs.com/wp-content/uploads/2018/04/Static-or-Dynamic-Navigation-for-Implant-Placement.pdf	Originality
174.	<i>Block MS, Emery RW, Cullum DR, Sheikh A. Implant Placement Is More Accurate Using Dynamic Navigation.</i>	Dynamic Implant Navigation Systems: A Review https://www.wjasr.in/uploads/150/5850_pdf.pdf	Originality
175.	<i>Vercruyssen M, Fortin T, Widmann G, Jacobs R, Quirynen M. Different techniques of static/dynamic guided implant surgery: modalities and indications.</i>	Dynamic Implant Navigation Systems: A Review https://www.wjasr.in/uploads/150/5850_pdf.pdf	Originality

CAD CAM complete denture fabrication a review article

by MIDSR Dental

General metrics

35,818

characters

5,129

words

431

sentences

20 min 30 sec

reading
time

39 min 27 sec

speaking
time

Score



This text scores better than 78%
of all texts checked by Grammarly

Writing Issues

263

Issues left

40

Critical

223

Advanced

Plagiarism



40

sources

15% of your text matches 40 sources on the web
or in archives of academic publications

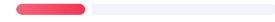
Writing Issues

122

Clarity

17

Wordy sentences



37

Intricate text



64

Passive voice misuse



3

Hard-to-read text



1

Outdated language

**58**

Engagement

58

Word choice

**83**

Correctness

26

Punctuation in compound/complex sentences



1

Misuse of quantifiers



19

Misspelled words



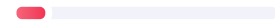
5

Misplaced words or phrases



7

Determiner use (a/an/the/this, etc.)



9

Comma misuse within clauses



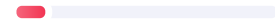
3

Unknown words



7

Closing punctuation



1

Text inconsistencies



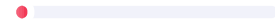
4

Improper formatting



1

Incorrect noun number



Unique Words**25%**

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Measures average word length

characters per word

Sentence Length**11.9**

Measures average sentence length

words per sentence

CAD CAM complete denture fabrication a review article

CAD-CAM: Complete denture fabrication: a review article

Abstract:

Edentulism has been a severe public health problem in industrialized countries due to aging and poor oral care. Design and fabrication of the complete dentures are mainly using conventional methods involving an enormous series of clinical and laboratory procedures. Edentulous patients have to make several visits to the clinic for the traditional fabrication of denture. Now the unceasing developments occur over several years. Present-day technological innovations allow the use of¹ various systems with computer-aided design/computer-aided manufacture (CAD/CAM) technology to produce complete dentures has seen exponential growth. There are different manufacturing techniques of CAD-CAM complete denture like AvaDent, Wieland digital denture, Baltic denture, DENTCA (whole you system). CAD-CAM technology requires only two appointments for the patient to get their complete removable denture. A reduction in clinical chair time also shortens the cost of care. The improved fit of the denture was because of less processing errors and simplifies the re-manufacturing of lost/broken prostheses due to the digital storage of denture data.² The pre-polymerized acrylic resin used by manufacturers for the fabrication of a denture base provides superior fit and strength when compared to conventionally processed bases^{3 4}. It doesn't show

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any polymerization shrinkage as there is less residual monomer therefore it reduces the potential infections as less candida albicans attachment to the denture bases. The motive of this article is to highlights the benefits of CAD-CAM technology over conventional denture fabrication.

Keywords: CAD-CAM, milling, digital intraoral impression, edentulism, complete denture

Introduction:

The absence of natural teeth disturbs people's lives in a physical and psychosocial way. The change in oral health status, especially the loss of natural teeth, often diminishes daily essential activities. These include the ability to masticate and communicate, as well as reluctance to appear in public. In contrast dentures can improve appearance, speech and function ensuring more self-confidence and involvement in social activities. Complete dentures have been the primary treatment for edentulous patients for decades. However, the procedure of making conventional complete dentures can occasionally be complicated and necessitates various steps. Moreover, dimensional change in the polymers throughout the denture processing leads to compromised fit. Recently, digital dentures have become more renowned and accepted in dentistry.¹

In dentistry, we have a long history of promoting to the desires of patient by contributing the restorative and prosthetic devices such as inlays, onlays, crowns, fixed partial dentures, implant abutments/prostheses and maxillofacial prostheses to recover patient's oral function and maintain their health.²

267 After nearly 80 years of minimally changed methods and protocols to fabricate complete dentures (CDs), the first commercially available computer-aided design/computer-aided manufacturing (CAD/CAM) denture systems indicated a new era in removable prosthodontics.³ Poly-methyl methacrylate (PMMA) was

268 the last of the materials developed in the 1930s. By 1940, 90 to 95 % of all dentures did produce using this material.⁴ During the past decade¹⁹ prosthetic dentistry was seriously²⁰ impacted by computer-driven technologies, which has also touched upon the rehabilitation of edentulous patients.¹⁸ In dentistry, the significant developments of dental CAD/CAM systems occurred in the 1980s. The fabrication of complete dentures by CAD-CAM methods has become widespread in²¹ both clinical and laboratory practices in recent years. This enhanced popularity may be associated to the improvements in the CAD-CAM techniques and the increasing awareness of dental practitioners and laboratory technicians, along with increased flexibility to unite parts of the digital workflow with standard clinical and laboratory protocols.²² 6

269 Three pioneers in specific contributed to the advancement of the current dental CAD/CAM systems. Dr. Duret was the first in the arena of dental CAD/CAM

270 improvement. Later he established the Sopa System which²³ influenced the later development of dental CAD/CAM systems²⁴ in the world. The second is Dr. Moermann, the developer of the CEREC® system. He attempted to use new expertise in a dental office clinically at the chair-side of patients. The emergence of this system was innovative because it allowed same-day ceramic

271 restorations. When this system was published, it rapidly spread the term CAD/CAM to the dental profession. The third is Dr. Andersson, the developer of the Procera® system.² His pioneering activities became commercially available as the Procera method of fabricating crowns in 1983.²⁵ The Procera

system was subsequently acquired by Nobelpharma (now Nobel Biocare) in 1988.⁷

To get conventional complete dentures, edentulous patients usually have to make five visits to the dental clinics for preliminary impressions, final impressions, recording jaw relations, a trial of the wax denture ²⁶ and insertion of complete dentures. The clinical and laboratory procedures performed manually.⁸ However, CAD-CAM denture system patients are required to spend less time in clinics and make fewer visits.⁹ Also, it requires less time for laboratory personnel work.¹⁰ Baba et al. summarized the commonly available digital methods for both complete and partial dentures. He reviewed the step-by-step procedures for the fabrication of complete ²⁷ digital dentures. A more recent review discussed four systems available to practitioners for the fabrication of ^{28 29} CAD/CAM complete ³⁰ dentures.¹¹ These systems are existing ³¹ for the construction of CAD/CAM dentures: AvaDent denture system, Wieland Digital Denture, Baltic Denture System, DENTCA (Whole You) system.

²⁷² | This article aims to review the different techniques available for the fabrication of CAD/CAM complete dentures.

Manufacturing techniques:

AvaDent:

AvaDent was created by Global Dental Science (the ground-breaking company) in 2011 by an international team of leaders in digital dentistry. ³² AvaDent dentures can be completed ³³ in 2 appointments. If the clinician wants to order a try-in denture to assess phonetics, function and esthetics then the digital ^{34 35} complete ³⁶ dentures can be completed in 3 appointments ^{37 38} .

The AvaDent system having two types of denture:

First ³⁹ type is a milled denture base with bonded teeth.

Second ⁴⁰ type is a monolithic prosthesis.

In monolithic prosthesis⁴¹ the AvaDent extream⁴² cross-linked (XCL) teeth and the base are present as a single unit. According to Avadent XCL teeth⁴³ it further classified⁴⁴ into two types:

- 273 | -The XCL-1 denture has a single-layer tooth that has a dentine core.
-The XCL-2 denture has a multiple-layered tooth that has a dentin and enamel core with natural morphology.¹²

The Avadent⁴⁵ system offers the possibility to produce complete dentures, record bases, single arch dentures, immediate complete⁴⁶ dentures, provisional dentures, occlusal lock splints, radiographic guides, verification jigs, bone reduction guides, conversion dentures, obturators and⁴⁷ definitive hybrid prostheses.¹¹

Procedures

In the Avadent system⁴⁸ definitive impression can be taken with existing denture so⁵⁰ preliminary impression⁵¹ is not required. The system also has prefabricated trays that can be adjusted and border molded using a polyvinyl siloxane (PVS) material. Definitive impressions are made⁵² using a light-body PVS impression material. Firstly, mix the 2 part heavy-consistency polyvinyl siloxane and press it into the existing denture to make a PVS cast. Make a definitive impression with the impression materials and thermoplastic moldable trays (figure.1) which are available⁵⁴ in different sizes.¹³

Figure.1 Avadent stock trays

- 274 | Evaluate the tray intraorally to ensure it covers all the appropriate anatomic areas and alter the borders as needed⁵⁵.¹³ The thermoplastic tray⁵⁶ is become softer by dipping it into hot⁵⁷ water bath at 80°C (170°F) for about 1 minute and
- 275 | then adjust the tray⁵⁸ to the putty cast by pressing the material into contact with

the cast or extending the ⁵⁹material to cover required areas. The adapted ⁶⁰trays can then be adjusted using acrylic resin burs to remove overextended areas.¹⁴ Adapt the trays on the putty cast. Then they are placed in the patient's mouth. It determines the regions of overextension or underextension and made needed adjustments. The maxillary tray must extend posteriorly to cover the area of the vibrating line and the pterygomaxillary fissures (hamular notches).⁶¹ It is also ⁶²important that the mandibular ⁶³tray ⁶⁴cover the retromolar pads, the buccal shelves, and available regions of the lateral throat form (retromylohyoid⁶⁵ area). Coverage of the appropriate maxillary areas requires determining the location of the vibrating line by having the patient pronounce the word "ah" or by coughing and by palpation of the distal aspect of the tuberosities to locate the pterygomaxillary fissures.⁶⁶ Defining the extension of the mandibular tray needs visually noticing the retromolar pads and reflecting the cheeks to localize the extent of the buccal shelves.⁶⁷ Assessment of the retromylohyoid⁶⁸ areas needs placing the head of a dental mirror into these regions and asking the patient to wet his /her lips with his/her tongue to accomplish the degree of displacement of the mirror by the tongue musculature.⁶⁹¹⁴ For recording the jaw relation a⁷⁰ separate device, the anatomic measuring device (AMD) is used.⁷¹ The AMD comprises of a mandibular partial arch tray with a flat tracing table and a maxillary partial arch tray that has a centrally adaptable contact point that supports as the central bearing pin for Gothic arch tracing and an adjustable lip support flange⁷²¹¹ (figure.2,3). AMD can be ²⁷⁶adjusted to establish the desired occlusal vertical dimension (OVD).¹⁵ The AMD is also used to determine the correct amount of upper lip support, the position of the maxillary six anterior teeth and the desired mediolateral orientation of the occlusal plane.⁷³¹⁴

277 Choose the correct size of the anatomic measuring device (AMD) (1 of 3
available sizes) (AvaDent) by using the caliper to measure the widest ⁷⁴ part of the
278 residual ridge. If the residual ridge is smaller in size ^{75,76} then use the smaller AMD
size. With the ⁷⁷ existing dentures in the mouth assess the occlusal vertical
dimension (OVD) and rest position with a preferred assessment method.16

Figure.2 Mandibular AMD with tracing plate and maxillary AMD with stylus

279 Figure.3 Maxillary and mandibular AMD placed fairly ⁷⁸ parallel to each other ⁷⁹
There is an occlusal plane orientation ruler that can be inserted into the
maxillary AMD and used to record the alignment of the maxillary AMD with the
interpupillary line so that the computer program will be able to ⁸⁰ align the
maxillary teeth with the interpupillary line.14 The AMD of the maxilla is filled
with registration material (Figure.4) which is provided by the system and placed
to record the morphology of the ridge and the portion of the palate that is
covered by the material. ⁸² The recording plate that is attached to the mandibular
tray is then filled ⁸³ with recording material. This is done ^{84 85} for the stabilization of
the tray ⁸⁶ in the mouth of the patient. Thus, we have now achieved in determining
280 the vertical dimension.17 If the existing dentures provide an appropriate
occlusal vertical dimension ⁸⁷ then they can be used to record the distance
between guiding marks on the face when the dentures are in occlusal contact.
If not, use conventional methods to determine the desired dimension. The rest
vertical dimension, facial proportions, tonicity of the musculature, speech and ⁸⁸
biofeedback can be used to ^{89 90} confirm the proper occlusal vertical dimension.14
Figure.3 Avadent ruler attached to the maxillary AMD. Figure.4 ⁹¹ Maxillary AMD
filled with recording material.

Protrusive and lateral mandibular movements are made by the patient to record Gothic arch tracing. The apex of the gothic arch tracing resembles an arrow and represents true centric relation. ⁹² A round acrylic resin bur is used to produce a ⁹³ small depression at the apex of the arrow then the mandible is guided until the ⁹⁴ pin fits in the created depression. ⁹⁵ Then an inter-occlusal registration material is injected between the maxillary and mandibular AMD trays to secure them together.¹² Send both the completed impressions and the final AMD to the laboratory for fabrication of the dentures.¹³

²⁸¹ Examine the digital preview virtual setup ⁹⁶ sent by the laboratory and modify the design of the denture if needed (Figure.5).¹³ If the clinician does not feel comfortable with the fabricated dentures without assessing phonetics, esthetics, and function ⁹⁷ then he can order for the try-in denture. ⁹⁸ Two types of the try-in denture are available: i) an advanced try-in denture, which is a milled base with recesses into which denture teeth ⁹⁹ are secured with wax ii) an all-resin milled bio-functional trial denture that is available in multiple teeth shades.¹² (Figure.6) The denture base is milled to fit the denture teeth which bond to the denture base using a bonding mechanism once the denture design ¹⁰⁰ is done.¹⁷ (Figure.7)

Figure.5 Digital preview of the complete dentures

Figure.6 A fully functional try-in milled out of a monolithic PMMA puck ¹⁰¹

Figure.7 Definitive AvaDent digital complete denture

Advantages of Avadent system:

AvaDent dentures

-look authentic, providing great esthetic because of extream ¹⁰² cross-linked teeth

-fit perfectly in the mouth

-do not cause pain or discomfort.

Disadvantages of Avadent system:

-A separate AMD device is required¹⁰³ for jaw relation.

-It requires¹⁰⁴ 3 appointment¹⁰⁵ if clinician¹⁰⁶ wants try-in¹⁰⁷

Wieland Digital Denture:

Wieland digital denture (Ivoclar Vivadent Inc., Amherst¹⁰⁸, NY) uses subtractive manufacturing for the fabrication of¹⁰⁹ their dentures.¹¹ This system is composed of a five axis-milling machine combined with a laboratory scanner and design software (3shape™).¹⁸ This system can only run for completely edentulous patients. Three clinical sessions are needed¹¹⁰ for the fabrication of removable dentures using this system. ¹²

The system allows for three methods to obtain clinical records:¹¹

- (1) Digitally designed and customized impression trays with united bite plates
- (2) Digitally designed and milled customized wax rims
- (3) Duplicated existing dentures.

During the first clinical session of denture design, preliminary maxillary and mandibular impressions are made with edentulous trays and adjusted in the patient's mouth using a poly (vinyl siloxane) impression material. Centric Tray is¹¹¹ used for preliminary bite taking which is a simple yet effective method.¹¹

(Figure.8)

The preliminary centric relation (CR) record and vertical relationship are¹¹² produced using a centric tray record. This data forms the idea for the fabrication of the customized impression trays with integrated bite plates.¹¹ At this stage, a UTS CAD device is attached¹¹³ to the handle of the centric tray.

(Figure.9,13) The basic¹¹⁴ bow assists the dentist in measuring Camper's line

(Figure. 10) (the angle of the occlusal plane concerning Camper's plane) and the

interpupillary line (Figure.11). The position of the occlusal plane can be read¹¹⁵
from the measurements obtained from the CL and IL scales.¹¹⁶ The preliminary
impressions, centric tray¹¹⁷ and the CL and IL measurements¹¹⁸ are sent to the
laboratory technician.¹²

Figure.8 Centric tray

In the laboratory, the dental technician scans the preliminary impressions and¹¹
the interocclusal record¹²⁰ are scanned. The camper line and interpupillary line
values are also entered¹²¹ in the design software that produces virtual models of
the edentulous jaws and determines the patient-specific occlusal plane.¹²

Figure.9 UTS CAD Figure. 10 A measure of deviation concerning camper plane

Figure.11 A measure of deviation concerning the frontal interpupillary plane

- 1 Basic bow
- 2 Bite fork
- 3 Bite fork & centric tray adapter
- 4 BP screw
- 5 BP indicators
- 6 BP scale
- 7 CE screw
- 8 CE indicator
- 9 CE scale
- 10 Screw bite fork fixation
- 11 Carrier
- 12 Rods
- 13 Clasp
- 14 Clasp washer

15 Clasp washer

Parts of UTS CAD:

Figure13. Parts of UTS CAD

The second clinical session consists of the definitive impression that was made with PVS in custom trays. The trays were the first border molded with a heavy-body PVS (Virtual Heavy Body; Ivoclar Vivadent AG). The participants were asked¹²³ to make lip and cheek movements until the impression material had polymerized. Then the impressions were completed with a light-body PVS.¹⁹ The occlusal plane was then re-evaluated¹²⁴ using UTS CAD. The Gnathometer (Figure14) is attached to the customized trays.¹¹ The occlusal vertical dimension (OVD) is determined using customary¹²⁵ methods. The midline, smile line, and lip closure line were marked, and tooth shape and tooth color were selected. The definitive impressions were used¹²⁶ to retain a click-on recording plate and a stylus. The vertical dimension, phonetics, facial proportions, and physiologic resting position were evaluated¹²⁷ with the impressions in place. Centric relation was acquired¹²⁸ by using the plate and stylus for gothic arch tracings. To stabilize the maxilla-mandibular relation,^{129,130} a scannable recording material (Virtual CAD bite Registration; Ivoclar Vivadent AG) was inserted.¹³¹¹⁹

Figure14. Gnathometer

The records and the functional impressions are scanned¹³² to determine the occlusal plane. At this stage, the denture teeth are chosen from the software library of denture teeth and the design program will suggest a virtual teeth setup^{96 135}. Following the selection of denture teeth, the program will suggest a virtual teeth set-up⁹⁶ in occlusion taking into consideration^{136 137} the curve of Spee and Wilson. The teeth setup can be modified according to the demands of the^{96 138}

clinician and patient or if no changes are requested, finalized by adding the gingival portion of the dentures.¹³⁹ A pre-polymerized disk of PMMA is used to mill the gingival portion¹⁴⁰ of the denture bases. If the clinician feels more comfortable ordering a try-in denture to assess phonetics, function, and esthetics and, if necessary, enable corrections to the try-in denture, the dental technician can mill a monolithic PMMA try-in denture.¹⁴¹

During the third session, the acrylic trial dentures were used¹⁴² to evaluate fit, retention, esthetics, maxillomandibular relationship, and occlusion of the future CD. If necessary changes were discussed with the patient and corrected by the dental technician.¹⁴³

283 | Using a five-axis milling machine, the laboratory will oversize mill the bases of the definitive dentures¹⁴³ from a homogenous pink PMMA resin disc²⁰ with specific alveoli for the prosthetic teeth, depending on the brand and model of the teeth selected (Figure 15).¹⁴⁴ Thereafter,¹⁴⁵ a positioning key is milled to ensure the ideal setting of the teeth during the bonding process with a PMMA resin (Figure 16).¹⁴⁶ Once the bonding is complete, the disc is placed¹⁴⁷ back into the machine to mill the denture intrados. The denture is removed from the disc,¹⁴⁸ scraped and polished according to the conventional procedure.¹⁸

Figure15. Definitive CD after final milling.

Figure16. A positioning key is milled to ensure the ideal setting of the teeth during the bonding process with a PMMA resin^{149,150}

In the fourth clinical session, the CAD/CAM complete denture insertion is almost identical to the insertion¹⁵¹ of a conventionally fabricated complete denture.¹⁵² Pressure indicator paste is used¹⁵³ to help the necessary adjustment in the fit of the intaglio surface to the mucosa.¹⁵⁴ The occlusal adjustment might be

essential and could be performed intraorally. The severe disparity in occlusal contacts between the dentures can be adjusted¹⁵⁵ following a clinical remount procedure.¹¹

Advantages of Wieland digital denture:

- Easy¹⁵⁶ transfer of the accurate occlusal plane position
- Specific transfer of the correct maxillomandibular relation and centric position
- Time-saving customized tray design and bite registration

Disadvantages of weiland¹⁵⁷ digital denture:

- A special¹⁵⁸ device, the centric tray is required for preliminary impression
- Also a special¹⁵⁹ device¹⁶⁰, UTS CAD¹⁶¹ is required¹⁶² for jaw relation record.¹⁶³

Baltic Denture System

The Baltic Denture System is designed¹⁶⁴ to provide patients with complete dentures in 2 appointments. The first appointment for an impression of mouth and second appointment is for full denture insertion.

Procedures

²⁸⁴ The Baltic Denture System allows the clinician to initiate the denture fabrication process utilizing functional impressions with the help of the¹⁶⁵ BDKEY Set components (Merz Dental GmbH) (Figure17). The initial¹⁶⁶ components¹⁶⁷ of the set include maxillary and mandibular adjustable record bases with teeth. These trays are available in 3 sizes (small, medium, or large) with different sizes and shapes of teeth. The trays¹⁶⁸ are adjusted intraorally.¹² Four tissue stops (Figure 18) were incorporated in the stress-bearing areas on the inner surface of the maxillary tray¹⁶⁹ using a pliable putty such as thermoplastic impression material (BD Impress) which is softened¹⁷⁰ at 75–85°C and later hardens to a plastic¹⁷¹ compound at the oral temperature.²¹

Figure17. The BD Key Sets corresponding to the Load Blanks of various shades and sizes.

Figure18. Tissue stops incorporated in the upper and lower key¹⁷²

The occlusal plane analyzer (BDKEY Plane and the BDKEY Fin) (Figure19) was attached to the upper impression tray following which the occlusal plane was oriented¹⁷³ parallel to the interpupillary line and the Camper's plane (Figure20).

The facial midline and anterior tooth visibility were also verified.²¹

Figure19. BD Key plane and Fin for orientation occlusal plane

Figure20. With the help of the BDKEY Set, the optimal alignment position is determined¹⁷⁴ according to functional and aesthetic perspectives in the inter-alveolar space^{175,176}

²⁸⁵ The definitive impressions are obtained while a registered facebow that¹⁷⁷ includes a vertical indicator is attached to the maxillary tray to register the facial midline¹⁷⁹. Then transfer the esthetic and functional components from the patient to the designing software. The facebow¹⁸⁰ helps the clinician to record the interpupillary line and camper line. The vertical indicator helps to record the¹⁸¹ midline. The centric lock (BD Key Lock) was used¹⁸² to secure the lower impression tray onto the upper tray, following the application of three tissue¹⁸³ stops (two in the molar region and one in the anterior region¹⁸⁴). So, it aid in jaw relation records.¹²

A virtual three-dimensional model¹⁸⁶ was obtained by importing the scanned data into the specialized software (BD Creator). The functional borders and reference points such¹⁸⁷ as the center of the ridge, the incisal papilla, and mid-palatal suture¹⁸⁸ were marked. It aids in aligning the teeth and even generating milling paths. The appropriate milling block (BD Load) (Figure.21) size and jaw

width ¹⁸⁹ were selected along with the teeth.²¹ The presence of teeth on the trays permits evaluation of the overall esthetics, lip support, tooth alignment, and interocclusal space. ¹⁹⁰ Since the BDKEY trays identically replicate the size and shape of the denture teeth in the milling blocks, they function as try-in dentures to confirm the patient's approval of the future dentures.¹² ¹⁹¹

Figure 21. BD Load

The laboratory generates data acquisition after scanning all the records sent by the clinician. The CAD design of the accessible data is recognized using the BDCreator software (Merz Dental GmbH). After design approval, the dentures are milled ¹⁹² in a five-axis computerized numerical control machine. The milling blanks are made of cross-linked polymethyl methacrylate (PMMA) and available in 3 different sizes. ¹⁹³ They have an integrated tooth setup ⁹⁶ in lingualized occlusion (Figure22). The anterior and posterior teeth are available in several sizes and shapes.¹² Following the milling, the dentures were separated from the blank using rotary instruments, and conventional finishing and polishing were performed. ¹⁹⁴ The dentures were inserted at the second appointment ¹⁹⁵ and ¹⁹⁶ minor occlusal adjustments were carried out. ¹⁹⁷ Overextensions of the denture flanges, if present, were altered, and the denture was finished and polished before delivery to the patient ¹⁹⁸ (Figure23). The patients were recalled after a week and then after 6 weeks for evaluation.²¹ ¹⁹⁹ ²⁰⁰

Figure22. Lingualised occlusion of the dental

Figure23. Baltic Complete Denture

Advantages of Baltic Complete Denture:

- Only 2 ²⁰¹ dentist appointments are required
- Perfect fit & perfect bite can be taken ²⁰²
- Lowest allergy potential

-Plaque-free surface

-Dentures of highest quality

DENTCA²⁰³ system

DENTCA²⁰⁴ system is now solely concentrated on denture design and the fabrication of the denture trays. Whole You system, a sister company, focuses on manufacturing When²⁰⁵ the clinician submits the definitive impressions and trays, the CAD part is completed²⁰⁶ by DENTCA and the CAM part is fulfilled by the²⁰⁷ Whole²⁰⁸ You system.¹² DENTCA²⁰⁹ system uses new cutting edge CAD/CAM technology to renovate and bring about a revolution of the complete dentures produced by this system. Research has shown advanced 3D software provides increased accuracy, creates more comfortable dentures for patients, and allows you to complete a full denture case 2.5× faster.¹⁷

The system allows the fabrication of complete dentures using 2²¹⁰ different methods: In the first method, additive method, a trial²¹¹ denture is printed and verified in the patient's mouth and then traditionally processed using a custom 3D printed flask. In the second method, the denture base is printed^{212,213} by a 3D printer, and the denture teeth are bonded²¹⁴ to the printed base²¹⁵.¹²

Procedures

Both maxillary and mandibular Dentca stock trays are two-piece trays with the detachable posterior segment (Figure²¹). The appropriately sized maxillary and mandibular stock trays are selected based on the patient's arch size. The Dentca²¹⁶ trays are used²¹⁷ for both the final impression and also for the jaw relation records. The trays²¹⁸ are painted²¹⁹ with an adhesive and a heavy-body poly (vinyl siloxane) impression material used for the border molding.¹² Definitive impressions of the maxillary and mandibular arches are made²²⁰ using a light-body poly (vinyl siloxane) impression material.¹⁴ Care must be taken²²¹ to ensure adequate border extensions and surface detail. The detachable segments of

the trays need to be removed after making the definitive impressions to record the appropriate vertical dimension of occlusion and centric relation.¹²

Figure 21. Maxillary and mandibular Dentca detachable stock trays

A #15C surgical blade is used to separate the posterior area of the maxillary and mandibular impression trays (Figure 24.). The anterior sections of the trays are placed in the mouth and the central pin of the gothic arch tracing device is adjusted to obtain the VDO.

Figure 24. The posterior portion of the tray separated with the use of a blade.

A vertical pin is attached to the mandibular impression tray, and both impression trays are placed back in the patient's mouth (Figure 25). The vertical dimension can be adjusted by rotating the vertical pin clockwise or counterclockwise.¹² When finalizing the occlusal vertical dimension, the mandibular stylus should contact the maxillary tracing plate.¹⁴

Figure 25. Mandibular Dentca impression tray showing the detachable posterior sections of the tray and the stylus used to record CR.

Once the vertical dimension is confirmed, a tracing pad (EZ-Tracer, DENTCA system) is placed on the maxillary impression tray, and both are placed back in the patient's mouth. The manufacturer suggests that CR be recorded with 1 of 3 techniques: a simplified tracing, a gothic arch tracing, or a direct interocclusal record. Once the CR point is determined, a small indentation is created with a bur to allow easy verification that the vertical pin is seated in CR. The interocclusal registration is made by locking both the maxillary and mandibular trays together while the patient is in CR. The final step involves

using the provided lip ruler to measure the distance from the incisive papilla to the inferior border of the upper lip that is the length of the maxillary lip.²³⁸

Also the processing of computer-aided design at the laboratory, the definitive impression is scanned using the Dentca CAD software through the source of the light (Laser) and receptor on the computer. The computer can calculate three-dimensional data from the image of the receptor unit. After recording the impression of both jaws, a 3- dimensional image is generated,²⁴⁰ and then the practitioner enters data to produce maxillomandibular virtual edentulous ridges using CAD software and²⁴¹ at the same time the technician can improve the lip length, as well as teeth arrangement or set up virtually.²²

The maxillary and mandibular impressions, interocclusal record, and recorded measurements are sent to the manufacturer for denture fabrication.²⁴² The records are 3D scanned and digitally articulated. Denture teeth are virtually arranged and customized.²⁴⁴ The designed denture is then 3D printed and shipped to the clinician for a try-in or used directly to fabricate the final complete dentures.²⁴⁵

The CAD/CAM complete denture insertion is almost identical to the insertion of a conventionally fabricated complete denture. Pressure indicator paste or Fit Checker™ (GC America, Alsip, IL) are used to help make the necessary adjustment in the fit of the intaglio surface to the mucosa.²⁴⁶ The occlusal adjustment might be essential and could be performed intraorally. The severe disparity in occlusal contacts between the dentures can be adjusted following a clinical remount procedure.²⁴⁷

Advantages of Dentca system:²⁵¹

-Advanced 3D software provides increased accuracy, more comfortable dentures for patient²⁵²

-The process and make denture making even simpler and faster

- Digital back up files allow for easy recovery
- Duplication and remake of lost/old denture prosthesis.

Conclusion

Fabrication of complete dentures utilizing CAD-CAM innovation has become more outstanding in the age of digitized dentistry. The article aims to review the different systems available for the ²⁵³ fabrication of CAD/CAM complete dentures. The manufacturing clinical concepts and techniques are distinct for each ²⁵⁴ system, ²⁵⁵ which facilitates the clinician's ability to choose their preferred ²⁵⁶ system for digital denture fabrication. ²⁵⁷ The continuous futuristic vision of digital technology in the field of dentures is important to improve the clinical and ²⁵⁸ laboratory performance of denture fabrication. So, the fabrication CAD/CAM complete dentures have positive benefits for both the patient and practitioner. Nevertheless, it has several ²⁵⁹ benefits ²⁶⁰ such as less time-consuming, reduced resin polymerization, re-manufacturing of the lost or broken prosthesis due to digital storage of denture data.

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301 | Schwindling FS, Stober T. A comparison of two digital techniques for the fabrication of complete removable dental prostheses: A pilot clinical study. J Prosthet Dent. 2016;116(5):756- 63

302 | The Fabrication of Digital Complete Dentures Nadim Z. Baba Treating the Complete Denture Patient, First Edition. Edited by Carl F. Driscoll and William Glen Golden. 2020

John AV, Abraham G, Alias A. Two-visit CAD/CAM milled dentures in the rehabilitation of edentulous arches: A case series. J Indian Prosthodont Soc 2019;19:88-92.

303 | Albaqawi Ahmed, Lopez J. N. Available CAD/CAM System Concepts for the Fabrication of Digital Dentures. J Am Sci 2019;15(5):47-55

1.	the use of	Wordy Sentences	Clarity
2.		Intricate Text	Clarity
3.	bases → stations, cores, plates	Word Choice	Engagement
4.		Intricate Text	Clarity
5.	therefore,	Punctuation in Compound/Complex Sentences	Correctness
6.	; therefore	Punctuation in Compound/Complex Sentences	Correctness
7.	less → fewer	Misuse of Quantifiers	Correctness
8.	albicans → Albicans	Misspelled Words	Correctness
9.	daily essential → essential daily	Misplaced Words or Phrases	Correctness
10.	a reluctance, or the reluctance	Determiner Use (a/an/the/this, etc.)	Correctness
11.	contrast,	Comma Misuse within Clauses	Correctness
12.	, and	Comma Misuse within Clauses	Correctness
13.	, ensuring	Punctuation in Compound/Complex Sentences	Correctness
14.	complete → full	Word Choice	Engagement
15.	the patient, or a patient	Determiner Use (a/an/the/this, etc.)	Correctness
16.	onlays → Onlays, inlays	Misspelled Words	Correctness
17.		Intricate Text	Clarity
18.	<i>By 1940, 90 to 95 % of all dentures did produce using this material.</i> ⁴	Intricate Text	Clarity

During the past decade prosthetic dentistry was seriously impacted by computer-driven technologies, which has also touched upon the rehabilitation of edentulous patients.

19.	decade,	Punctuation in Compound/Complex Sentences	Correctness
20.	seriously → severely	Word Choice	Engagement
21.	both	Wordy Sentences	Clarity
22.		Intricate Text	Clarity
23.	, which	Punctuation in Compound/Complex Sentences	Correctness
24.	in the world → globally	Wordy Sentences	Clarity
25.		Intricate Text	Clarity
26.	, and	Comma Misuse within Clauses	Correctness
27.	complete → full	Word Choice	Engagement
28.	fabrication → manufacture, manufacturing	Word Choice	Engagement
29.	to manufacture	Wordy Sentences	Clarity
30.	complete → full	Word Choice	Engagement
31.	are existing → exist	Wordy Sentences	Clarity
32.		Intricate Text	Clarity
33.	be completed	Passive Voice Misuse	Clarity
34.	, and	Comma Misuse within Clauses	Correctness
35.	esthetics,	Punctuation in	Correctness

		Compound/Complex Sentences	
36.	complete digital	Misplaced Words or Phrases	Correctness
37.	appointments → offices, meetings, arrangements	Word Choice	Engagement
38.		Intricate Text	Clarity
39.	The first	Determiner Use (a/an/the/this, etc.)	Correctness
40.	The second	Determiner Use (a/an/the/this, etc.)	Correctness
41.	prosthesis,	Comma Misuse within Clauses	Correctness
42.	extream → extreme	Misspelled Words	Correctness
43.	Avadent → Avant	Misspelled Words	Correctness
44.	teeth,	Punctuation in Compound/Complex Sentences	Correctness
45.	Avadent → Avant	Misspelled Words	Correctness
46.	complete → full	Word Choice	Engagement
47.	, and	Comma Misuse within Clauses	Correctness
48.	Avadent → Avant	Misspelled Words	Correctness
49.	system,	Comma Misuse within Clauses	Correctness
50.	, so	Punctuation in Compound/Complex Sentences	Correctness
51.	impression → opinion	Word Choice	Engagement
52.	impressions → prints, ideas	Word Choice	Engagement
53.	are made	Passive Voice Misuse	Clarity

54.	which are	Wordy Sentences	Clarity
55.	as needed	Wordy Sentences	Clarity
56.	tray → plate	Word Choice	Engagement
57.	a hot	Determiner Use (a/an/the/this, etc.)	Correctness
58.	tray → plate, dish, shelf	Word Choice	Engagement
59.	material → cloth	Word Choice	Engagement
60.	trays → plates, dishes, shelves	Word Choice	Engagement
61.	<i>The maxillary tray must extend posteriorly to cover the area of the vibrating line and the pterygomaxillary fissures (hamular notches).</i>	Hard-to-read text	Clarity
62.	important → essential, vital, crucial	Word Choice	Engagement
63.	tray → plate	Word Choice	Engagement
64.	cover → include	Word Choice	Engagement
65.	<i>retromylohyoid</i>	Unknown Words	Correctness
66.		Intricate Text	Clarity
67.		Intricate Text	Clarity
68.	<i>retromylohyoid</i>	Unknown Words	Correctness
69.	..14	Hard-to-read text	Clarity
70.	, a	Punctuation in Compound/Complex Sentences	Correctness
71.	<i>is used</i>	Passive Voice Misuse	Clarity

72.		Intricate Text	Clarity
73.		Intricate Text	Clarity
74.	widest → fullest	Word Choice	Engagement
75.	size → format	Word Choice	Engagement
76.	size,	Punctuation in Compound/Complex Sentences	Correctness
77.	With the → The	Wordy Sentences	Clarity
78.	fairly → reasonably	Word Choice	Engagement
79.	other.	Closing Punctuation	Correctness
80.	be able to	Wordy Sentences	Clarity
81.	, which	Punctuation in Compound/Complex Sentences	Correctness
82.		Intricate Text	Clarity
83.	<i>is then filled</i>	Passive Voice Misuse	Clarity
84.	<i>This</i>	Intricate Text	Clarity
85.	<i>is done</i>	Passive Voice Misuse	Clarity
86.	tray → shelf, dish	Word Choice	Engagement
87.	dimension,	Punctuation in Compound/Complex Sentences	Correctness
88.	, and	Comma Misuse within Clauses	Correctness
89.	<i>be used</i>	Passive Voice Misuse	Clarity
90.	be used to	Wordy Sentences	Clarity

91.	Figure → Number	Word Choice	Engagement
92.	<i>is used</i>	Passive Voice Misuse	Clarity
93.	apex → top	Word Choice	Engagement
94.	arrow → shaft, bolt	Word Choice	Engagement
95.		Intricate Text	Clarity
96.	<i>setup; set-up</i>	Text Inconsistencies	Correctness
97.	function,	Punctuation in Compound/Complex Sentences	Correctness
98.		Intricate Text	Clarity
99.	<i>are secured</i>	Passive Voice Misuse	Clarity
100.	<i>is done</i>	Passive Voice Misuse	Clarity
101.	puck.	Closing Punctuation	Correctness
102.	extream → extreme	Misspelled Words	Correctness
103.	<i>is required</i>	Passive Voice Misuse	Clarity
104.	requires → needs	Word Choice	Engagement
105.	3 → three	Improper Formatting	Correctness
106.	appointment → appointments	Incorrect Noun Number	Correctness
107.	the clinician	Determiner Use (a/an/the/this, etc.)	Correctness
108.	Amhort → Amherst	Misspelled Words	Correctness
109.	to fabricate	Wordy Sentences	Clarity
110.	<i>are needed</i>	Passive Voice Misuse	Clarity

111.	<i>is used</i>	Passive Voice Misuse	Clarity
112.	<i>are produced</i>	Passive Voice Misuse	Clarity
113.	<i>is attached</i>	Passive Voice Misuse	Clarity
114.	basic → primary	Word Choice	Engagement
115.	<i>be read</i>	Passive Voice Misuse	Clarity
116.		Intricate Text	Clarity
117.	, and	Comma Misuse within Clauses	Correctness
118.	<i>are sent</i>	Passive Voice Misuse	Clarity
119.	, and	Punctuation in Compound/Complex Sentences	Correctness
120.	<i>are scanned</i>	Passive Voice Misuse	Clarity
121.	<i>are also entered</i>	Passive Voice Misuse	Clarity
122.	<i>was made</i>	Passive Voice Misuse	Clarity
123.	<i>were asked</i>	Passive Voice Misuse	Clarity
124.	<i>was then re-evaluated</i>	Passive Voice Misuse	Clarity
125.	customary → conventional, common	Word Choice	Engagement
126.	<i>were used</i>	Passive Voice Misuse	Clarity
127.	<i>were evaluated</i>	Passive Voice Misuse	Clarity
128.	<i>was acquired</i>	Passive Voice Misuse	Clarity
129.	<i>To stabilize the maxilla-mandibular relation</i>	Misplaced Words or Phrases	Correctness
130.	relation → connection, association,	Word Choice	Engagement

	relationship, link		
131.	<i>was inserted</i>	Passive Voice Misuse	Clarity
132.	<i>are scanned</i>	Passive Voice Misuse	Clarity
133.	<i>are chosen</i>	Passive Voice Misuse	Clarity
134.	, and	Punctuation in Compound/Complex Sentences	Correctness
135.		Intricate Text	Clarity
136.	, taking	Punctuation in Compound/Complex Sentences	Correctness
137.	considering	Wordy Sentences	Clarity
138.	<i>be modified</i>	Passive Voice Misuse	Clarity
139.		Intricate Text	Clarity
140.	<i>is used</i>	Passive Voice Misuse	Clarity
141.	portion → part, piece	Word Choice	Engagement
142.	<i>were used</i>	Passive Voice Misuse	Clarity
143.	definitive → final	Word Choice	Engagement
144.		Intricate Text	Clarity
145.	Thereafter → After that	Outdated Language	Clarity
146.		Intricate Text	Clarity
147.	<i>is placed</i>	Passive Voice Misuse	Clarity
148.	disc → drive, CD	Word Choice	Engagement
149.		Intricate Text	Clarity

150.	resin.	Closing Punctuation	Correctness
151.	insertion → addition, introduction, inclusion	Word Choice	Engagement
152.		Intricate Text	Clarity
153.	<i>is used</i>	Passive Voice Misuse	Clarity
154.		Intricate Text	Clarity
155.	<i>be adjusted</i>	Passive Voice Misuse	Clarity
156.	Easy → Smooth, Secure	Word Choice	Engagement
157.	woiland → Weiland	Misspelled Words	Correctness
158.	special → particular, unique	Word Choice	Engagement
159.	Also,	Punctuation in Compound/Complex Sentences	Correctness
160.	special → particular, unique	Word Choice	Engagement
161.	device → tool, equipment	Word Choice	Engagement
162.	CAD,	Punctuation in Compound/Complex Sentences	Correctness
163.	required → necessary	Word Choice	Engagement
164.	<i>is designed</i>	Passive Voice Misuse	Clarity
165.	help of the	Wordy Sentences	Clarity
166.	initial → primary, fundamental, first	Word Choice	Engagement
167.	components → parts, elements	Word Choice	Engagement
168.	trays → shelves, plates, dishes	Word Choice	Engagement

169.	tray → plate	Word Choice	Engagement
170.	<i>is softened</i>	Passive Voice Misuse	Clarity
171.		Intricate Text	Clarity
172.	key.	Closing Punctuation	Correctness
173.	<i>was oriented</i>	Passive Voice Misuse	Clarity
174.	<i>is determined</i>	Passive Voice Misuse	Clarity
175.		Intricate Text	Clarity
176.	space.	Closing Punctuation	Correctness
177.	<i>are obtained</i>	Passive Voice Misuse	Clarity
178.	facebow → facebook	Misspelled Words	Correctness
179.		Intricate Text	Clarity
180.	<i>facebow</i>	Unknown Words	Correctness
181.	record → mark	Word Choice	Engagement
182.	<i>was used</i>	Passive Voice Misuse	Clarity
183.	tray → plate, shelf	Word Choice	Engagement
184.	the application of	Wordy Sentences	Clarity
185.	region → part, area	Word Choice	Engagement
186.	A three-dimensional virtual	Misplaced Words or Phrases	Correctness
187.	, such	Punctuation in Compound/Complex Sentences	Correctness
188.	suture,	Punctuation in Compound/Complex Sentences	Correctness

189.	<i>were selected</i>	Passive Voice Misuse	Clarity
190.		Intricate Text	Clarity
191.		Intricate Text	Clarity
192.	<i>are milled</i>	Passive Voice Misuse	Clarity
193.	<i>The milling blanks are made of cross-linked polymethyl methacrylate (PMMA) and available in 3 different sizes.</i>	Hard-to-read text	Clarity
194.	<i>were performed</i>	Passive Voice Misuse	Clarity
195.	<i>were inserted</i>	Passive Voice Misuse	Clarity
196.	, and	Punctuation in Compound/Complex Sentences	Correctness
197.	<i>were carried</i>	Passive Voice Misuse	Clarity
198.	<i>Overextensions of the denture flanges, if present, were altered, and the denture was finished and polished before delivery to the patient (Figure23).</i>	Intricate Text	Clarity
199.	6 → six	Improper Formatting	Correctness
200.	evaluation.21.	Closing Punctuation	Correctness
201.	2 → two	Improper Formatting	Correctness
202.	<i>be taken</i>	Passive Voice Misuse	Clarity
203.	DENTCA → DECA	Misspelled Words	Correctness
204.	DENTCA → DECA	Misspelled Words	Correctness
205.	.When	Punctuation in Compound/Complex Sentences	Correctness

206.	<i>is completed</i>	Passive Voice Misuse	Clarity
207.	, and	Punctuation in Compound/Complex Sentences	Correctness
208.	<i>by the Whole</i>	Misplaced Words or Phrases	Correctness
209.	DENTCA → DECA	Misspelled Words	Correctness
210.	2 → two	Improper Formatting	Correctness
211.	a trial → a temporary	Word Choice	Engagement
212.	<i>is printed</i>	Passive Voice Misuse	Clarity
213.	printed → written, published	Word Choice	Engagement
214.	<i>are bonded</i>	Passive Voice Misuse	Clarity
215.	base → core	Word Choice	Engagement
216.	Dentca → Dementia	Misspelled Words	Correctness
217.	<i>are used</i>	Passive Voice Misuse	Clarity
218.	trays → plates, shelves, dishes	Word Choice	Engagement
219.	<i>are painted</i>	Passive Voice Misuse	Clarity
220.	<i>are made</i>	Passive Voice Misuse	Clarity
221.	<i>be taken</i>	Passive Voice Misuse	Clarity
222.	<i>be removed</i>	Passive Voice Misuse	Clarity
223.		Intricate Text	Clarity
224.	<i>is used</i>	Passive Voice Misuse	Clarity
225.	trays → dishes, plates, shelves, bins	Word Choice	Engagement

226.	<i>are placed</i>	Passive Voice Misuse	Clarity
227.	, and	Punctuation in Compound/Complex Sentences	Correctness
228.	VDO.20.	Closing Punctuation	Correctness
229.	<i>be adjusted</i>	Passive Voice Misuse	Clarity
230.	Dentca → Dental	Misspelled Words	Correctness
231.	tray → plate, dish, shelf	Word Choice	Engagement
232.		Intricate Text	Clarity
233.	<i>is placed</i>	Passive Voice Misuse	Clarity
234.	<i>are placed</i>	Passive Voice Misuse	Clarity
235.	placed → set	Word Choice	Engagement
236.	<i>be recorded</i>	Passive Voice Misuse	Clarity
237.	allow easy verification → verify	Wordy Sentences	Clarity
238.		Intricate Text	Clarity
239.	Also,	Punctuation in Compound/Complex Sentences	Correctness
240.	<i>is generated</i>	Passive Voice Misuse	Clarity
241.	, and	Punctuation in Compound/Complex Sentences	Correctness
242.	<i>are sent</i>	Passive Voice Misuse	Clarity
243.		Intricate Text	Clarity
244.	records → files, documents, papers	Word Choice	Engagement

245.	<i>are virtually arranged</i>	Passive Voice Misuse	Clarity
246.	insertion → addition, introduction, inclusion	Word Choice	Engagement
247.		Intricate Text	Clarity
248.	<i>are used</i>	Passive Voice Misuse	Clarity
249.		Intricate Text	Clarity
250.	<i>be adjusted</i>	Passive Voice Misuse	Clarity
251.	Dentca → Dental	Misspelled Words	Correctness
252.	the patient, or a patient	Determiner Use (a/an/the/this, etc.)	Correctness
253.	fabrication → manufacture	Word Choice	Engagement
254.	system → order	Word Choice	Engagement
255.	which facilitates → facilitating	Wordy Sentences	Clarity
256.	system → method	Word Choice	Engagement
257.	important → essential, vital	Word Choice	Engagement
258.		Intricate Text	Clarity
259.	benefits → advantages	Word Choice	Engagement
260.	such as → :	Wordy Sentences	Clarity
261.	Nadica → Nadia	Misspelled Words	Correctness
262.	Nirisha → Nisha	Misspelled Words	Correctness
263.	Veyrun → Veyron	Misspelled Words	Correctness
264.	<i>provides superior fit and strength</i>	Available online www.ijpras.com	Originality

	<i>when compared to conventionally processed bases.</i>	International Journal of ... https://ijpras.com/storage/models/article/gpOSn3fVYj6UoHSZqXI3Bkw774hwXVIS2u4SaSHr3hcXyF7KtALtg9KGgow2/the-use-of-fourier-transform-infra-red-ftir-spectroscopic-analysis-and-cell-viability-assay-to-ass.pdf	
265.	<i>The change in oral health status, especially the loss of natural teeth, often diminishes daily essential activities. These include the ability to masticate and communicate, as well as reluctance to appear in public.</i>	Comparative assessment of conventional vs. CAD/CAM ... https://ir.uiowa.edu/cgi/viewcontent.cgi?article=7006&context=etd	Originality
266.	<i>In dentistry, we have a long history of</i>	A review of dental CAD/CAM: current status and future ... https://pdfs.semanticscholar.org/90af/18138a8e3af7c16ea5ab474d854f044eb9b8.pdf	Originality
267.	<i>After nearly 80 years of minimally changed methods and protocols to fabricate complete dentures (CDs), the first commercially available computer-aided design/computer-aided manufacturing (CAD/CAM) denture systems</i>	Complete Dentures Fabricated with CAD/CAM Technology and a ... https://pdfs.semanticscholar.org/a1c7/c0dd3e5e109430b7f9f5ff3616992680451f.pdf	Originality
268.	<i>By 1940, 90 to 95 % of all dentures</i>	Materials and Processes for CAD/CAM Complete Denture ... https://www.deepdyve.com/lp/springer-journals/materials-and-processes-for-cad-cam-complete-denture-fabrication-7MAeTAaMWT	Originality
269.	<i>awareness of dental practitioners and laboratory technicians, along with</i>	CAD-CAM milled versus rapidly prototyped (3D-printed) ... https://www.avadent.com/wp-content/uploads/2019/04/Milled-versus-Printed.pdf	Originality
270.	<i>the later development of dental CAD/CAM systems in the world. The</i>	A review of dental CAD/CAM: current status and future ...	Originality

	<i>second is Dr. Moermann, the developer of the CEREC</i>	https://pdfs.semanticscholar.org/90af/18138a8e3af7c16ea5ab474d854f044eb9b8.pdf	
271.	<i>it rapidly spread the term CAD/CAM to the dental profession. The third is Dr. Andersson, the developer of the Procera</i>	A review of dental CAD/CAM: current status and future ... https://pdfs.semanticscholar.org/90af/18138a8e3af7c16ea5ab474d854f044eb9b8.pdf	Originality
272.	<i>This article aims to review the different techniques available</i>	How Can Blood Flow Be Measured? - ScienceDirect https://www.sciencedirect.com/science/article/pii/S0039625707001853	Originality
273.	<i>XCL-1 denture has a single-layer tooth that has a</i>	Computer-aided designing and computer-aided manufacturing ... http://www.ijocr.org/article.asp?issn=2347-6249;year=2019;volume=7;issue=1;spage=24;epage=26;aulast=Basith	Originality
274.	<i>Evaluate the tray intraorally to ensure it covers all the appropriate anatomic areas and</i>	CAM technology. - PDF Download Free https://docksci.com/cam-technology_5b069f72d64ab2bb463812f5.html	Originality
275.	<i>to the putty cast by pressing the material into contact with the cast</i>	Technology | Denture Design Clinic https://denturedesignclinic.com/technology/	Originality
276.	<i>The AMD is also used to determine the correct amount of upper lip support, the position of the maxillary six anterior teeth and the desired</i>	Minimal Visit Complete Denture https://www.slideshare.net/doctorsanshul/minimal-visit-complete-denture-125919435	Originality
277.	<i>anatomic measuring device (AMD) (1 of 3 available sizes) (AvaDent) by using the caliper to measure the widest part of the residual ridge.</i>	CAM technology. - PDF Download Free https://docksci.com/cam-technology_5b069f72d64ab2bb463812f5.html	Originality
278.	<i>use the smaller AMD size. With the</i>	CAM technology. - PDF Download	Originality

	<i>existing dentures in the mouth assess the occlusal vertical dimension (OVD) and rest position with a preferred assessment method.</i>	Free https://docksci.com/cam-technology_5b069f72d64ab2bb463812f5.html	
279.	<i>There is an occlusal plane orientation ruler that can be inserted into the maxillary AMD and used to record the alignment of the maxillary AMD with the interpupillary line</i>	Minimal Visit Complete Denture https://www.slideshare.net/doctorsanshul/minimal-visit-complete-denture-125919435	Originality
280.	<i>If the existing dentures provide an appropriate occlusal vertical</i>	Technology | Denture Design Clinic https://denturedesignclinic.com/technology/	Originality
281.	<i>Examine the digital preview virtual setup sent by the laboratory and modify the design of the denture if needed</i>	CAM technology. - PDF Download Free https://docksci.com/cam-technology_5b069f72d64ab2bb463812f5.html	Originality
282.	<i>The position of the occlusal plane can be read from the</i>	Wieland Digital Denture - LinkedIn SlideShare https://www.slideshare.net/DrlbrahimSoubtDDSMBA/wieland-digital-denture	Originality
283.	<i>Using a five-axis milling machine, the laboratory will oversize mill the bases of the definitive dentures from a homogenous</i>	Immediate Complete Dentures - DentistryKey https://dentistrykey.com/library/immediate-complete-dentures/	Originality
284.	<i>The Baltic Denture System allows the clinician to initiate the denture fabrication process utilizing functional impressions</i>	Computer-aided designing and computer-aided manufacturing ... http://www.ijocr.org/article.asp?issn=2347-6249;year=2019;volume=7;issue=1;spage=24;epage=26;aulast=Basith	Originality
285.	<i>facebow that includes a vertical indicator is attached to the maxillary tray to register the facial midline.</i>	Computer-aided designing and computer-aided manufacturing ... http://www.ijocr.org/article.asp?issn=2347-6249;year=2019;volume=7;issue=1;spage=24;epage=26;aulast=Basith	Originality

286.	<i>advanced 3D software provides increased accuracy, creates more comfortable dentures for patients, and allows you to complete a full denture case 2.</i>	Home | Dentca https://www.dentca.com/	Originality
287.	<i>Definitive impressions of the maxillary and mandibular arches</i>	Purpose This report was been made to present a case ... https://www.coursehero.com/file/p85c9ak/Purpose-This-report-was-been-made-to-present-a-case-treatment-option-for-the/	Originality
288.	<i>A #15C surgical blade is used to separate the posterior area of the maxillary and mandibular impression trays</i>	Immediate Complete Dentures - DentistryKey https://dentistrykey.com/library/immediate-complete-dentures/	Originality
289.	<i>The anterior sections of the trays are placed in the mouth and the central pin of the gothic arch tracing device is adjusted to obtain the</i>	Immediate Complete Dentures - DentistryKey https://dentistrykey.com/library/immediate-complete-dentures/	Originality
290.	<i>Mandibular Dentca impression tray showing the detachable posterior sections of the tray and the stylus used to record CR.</i>	Immediate Complete Dentures - DentistryKey https://dentistrykey.com/library/immediate-complete-dentures/	Originality
291.	<i>the computer. The computer can calculate three-dimensional data from the image of the receptor unit. After recording the impression of both jaws, a 3- dimensional image is generated, and then the practitioner enters data to produce maxillomandibular virtual edentulous ridges using CAD software and ...</i>	Journal of American Science 2019;15(5) http://www ... http://www.jofamericanscience.org/journals/am-sci/jas150519/07_34820jas150519_47_55.pdf	Originality
292.	<i>The manufacturing clinical concepts and techniques are distinct for each system, which facilitates the</i>	Journal of American Science 2019;15(5) http://www ... http://www.jofamericanscience.org/journals/am-sci/jas150519/07_34820jas150519_47_55.pdf	Originality

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|------|---|---|-------------|
| 293. | <i>ability to choose their preferred system for digital denture fabrication. The continuous futuristic vision of digital technology in the field of dentures is important to improve the clinical and laboratory performance of denture fabrication.</i> | Journal of American Science 2019;15(5) http://www ...
http://www.jofamericanscience.org/journals/am-sci/jas150519/07_34820jas150519_47_55.pdf | Originality |
| 294. | <i>Sivakumar I, Sajjan S, Ramaraju AV, Rao B. Changes in Oral Health-Related Quality of Life in Elderly Edentulous Patients after Complete Denture Therapy and Possible Role of their Initial Expectation: A Follow-Up Study. Journal of prosthodontics: official journal of the American College of Prosthodo...</i> | Comparative assessment of conventional vs. CAD/CAM ...
https://ir.uiowa.edu/cgi/viewcontent.cgi?article=7006&context=etd | Originality |
| 295. | <i>Complete Dentures Fabricated with CAD/CAM Technology and a Traditional Clinical Recording Method.</i> | Complete Dentures Fabricated with CAD/CAM Technology and a ...
https://pdfs.semanticscholar.org/a1c7/c0dd3e5e109430b7f9f5ff3616992680451f.pdf | Originality |
| 296. | <i>CAD-CAM milled versus rapidly prototyped (3D-printed) complete dentures: An in vitro evaluation of trueness.</i> | CAD-CAM milled versus rapidly prototyped (3D-printed ...
https://www.sciencedirect.com/science/article/abs/pii/S0022391318307133 | Originality |
| 297. | <i>Materials and processes for CAD/CAM complete denture fabrication. Curr Oral Health Rep. 2016;3</i> | Available online www.ijpras.com International Journal of ...
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| 298. | <i>Baba NZ, AlRumaih HS, Goodacre BJ, Goodacre CJ. Current techniques in CAD/CAM denture fabrication. Gen Dent. 2016;64:23-8.</i> | CAD-CAM milled versus rapidly prototyped (3D-printed ...
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| 299. | <i>Infante L, Yilmaz B, McGlumphy, Finger I. Fabricating complete dentures with CAD/CAM technology. J Prosthet Dent. 2014;111</i> | Complete Dentures Fabricated with CAD/CAM Technology and a ...
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| 300. | <i>Bilgin MS, Baytaroglu EN, Erdem A, Dilber E. A review of computer-aided design/computer-aided manufacture techniques for removable denture fabrication.</i> | Comparative assessment of conventional vs. CAD/CAM ...
https://ir.uiowa.edu/cgi/viewcontent.cgi?article=7006&context=etd | Originality |
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| 301. | <i>Schwindling FS, Stober T. A comparison of two digital techniques for the fabrication of complete removable dental prostheses: A pilot clinical study. J Prosthet Dent. 2016;116</i> | Complete Dentures Fabricated with CAD/CAM Technology and a ...
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| 302. | <i>Treating the Complete Denture Patient, First Edition. Edited by Carl F. Driscoll and William Glen Golden. 2020 John</i> | Immediate Complete Dentures - DentistryKey
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| 303. | <i>Albaqawi Ahmed, Lopez J. N. Available CAD/CAM System Concepts for the Fabrication of Digital Dentures. J Am Sci 2019;15(5):47-55</i> | Journal of American Science 2019;15(5) http://www...
http://www.jofamericanscience.org/journals/am-sci/jas150519/07_34820jas150519_47_55.pdf | Originality |
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Screw vs cement retained

by MIDSER Dental

General metrics

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219

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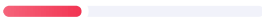




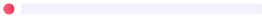
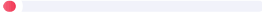







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Writing Issues

128

Correctness

12	Comma misuse within clauses	
5	Faulty subject-verb agreement	
40	Determiner use (a/an/the/this, etc.)	
21	Punctuation in compound/complex sentences	
33	Misspelled words	
1	Incorrect verb forms	
2	Wrong or missing prepositions	
4	Incorrect noun number	
4	Confused words	
2	Improper formatting	
1	Pronoun use	
1	Mixed dialects of english	
1	Misplaced words or phrases	
1	Incomplete sentences	

45

Clarity

16	Passive voice misuse	
15	Intricate text	
14	Wordy sentences	

22

Engagement

22	Word choice	
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Screw vs cement retained

Title-

Screw vs. Cement Retained Prostheses: A literature review

Screw ¹vs Cement Retained Prostheses: A Clinical Dilemma!

Comparison of Screw and Cement Retained Prostheses: Review Article

ABSTRACT:

Dental implant survival has been dependent on skills, materials, techniques ²and appropriate case selection. Implant failure still ³occur in dentistry, either mechanical or biological or both. Screw and cement ⁴are used to secure the prosthesis. ⁵Choice of retention varies in the literature surrounding controversies to it. This review article helps to survey the various benefits ⁶and drawbacks of screw retained and cement retained, clinical significance, ⁷esthetics, retrievability, long term effect surrounding the method for retention ⁸of prosthesis ^{9 10 11}. This might help the clinician in optimizing their treatment protocol for the long-term success of ¹²implant.

Keywords: Screw retained; Cement retained.

INTRODUCTION:

Prosthesis can be retained to implant fixture by screw or cement.¹ It has been¹³ noted that the choice is generally a clinician dependent rather than governed by scientific evidence.² In present literature¹⁴ extensive data is available for each¹⁵ type of method of retention, advantages and disadvantages of techniques.¹⁶¹⁷ Many authors have suggested that cement retained¹⁸ prosthesis have better esthetics, passivity in fit and controlling the occlusion is simpler. 4-9 However, the chances of leaving excess¹⁹ of cement²⁰ in the peri-implant area is of major²¹ concern. 5,9 On the other hand, many reports that due to their retrievability and maintenance of hygiene is easier^{22,23} it is advantageous.^{5,7} Screw loosening is most often found²⁴ to be a major²⁵ problem for the clinician. 3,10 The purpose of this article is to help the clinician modify their treatment approach accordingly.

PROVISIONALIZATION AND ESTHETICS:

Esthetics zone are²⁶ particularly challenging in implant dentistry. It is very²⁷ difficult²⁸ in attaining²⁹ soft tissue profile and ideal contact as that of previous³⁰ natural tooth. In order to achieve a stable and predictable³¹ outcome³² it is necessary to consider the treatment planning process which includes the surgical risk factor and end prosthetic result.¹¹

It is necessary to give a provisional restoration so that it would be easier to obtain a good³³ emergence profile and³⁴ peri-implant soft tissue growth is adequately achieved³⁵ which³⁶ will be in harmonious relation with neighboring soft and hard tissue.

Clinical Significance-

The provisional restoration is of particular importance when it comes to implant³⁷ placed at bone³⁸ crest level. There is considerable³⁹ advantage to this in

which the dentist can individualize the emergence profile, crown margin and³⁹ mucosal zenith.

Screw retention is preferred in such cases as it is easy to remove as compared to cement in which care should be taken for the removal of excess cement⁴⁰ which could lead to peri-implantitis.⁴¹⁴²12,13

This⁴³ is of particular importance in anterior⁴⁴ region where soft tissue inflammation could be unaesthetic.¹⁴

ACCESS OPENINGS-

Screw retained prostheses have access openings which⁴⁵ could compromise aesthetics in anterior⁴⁶ region. This⁴⁷ would require placing the implant palatally than the ideal facial position. Due to presence⁴⁸ of any anatomical landmark if it is not possible to place implant⁴⁹ in an ideal⁵⁰ position use of custom made or preangled⁵¹ abutments can be done to relocate the access away from aesthetic area.¹²

Clinical significance-

Screw retained prostheses require the use of facial porcelain ridge lap because of placement of implant palatally. This⁵² makes maintenance of hygiene in cervical sulcus extremely difficult. This⁵³ is not an issue with cement retained⁵⁴ prostheses in which implant can be placed⁵⁵ in an ideal position and⁵⁶ better emergence profile can be obtained⁵⁷.⁷

OCCLUSION

Cement retained prostheses have a definite advantage in which stable and ideal occlusal contact can be easily obtained.⁵⁸ 7,15,16 In some cases, use of larger diameter implants leads to a large access opening which could occupy upto 50% of the occlusal table.⁶¹ This leads to occlusal instability and in protrusive and lateral excursive movements. Restorative material used to cover such type of openings often wear under occlusal load.⁶² 17 Also, the load applied on the implant by the restorative material will be in lateral direction and not directed axially which could lead to failure.⁶³ The use of restorative material is justified if its sole aim is to provide occlusion and no lateral forces act on it.⁶⁴ ⁶⁵ ⁶⁶ ⁶⁷ ⁶⁸ ⁶⁹ ⁷⁰

Clinical Significance:

Occlusal stability can be achieved by both cement and screw retained prostheses.⁷¹ Screw retained prostheses can also achieve good occlusal contact in spite of the screw access channel provided little or no force is exerted on the access filling rather than the crown portion itself.⁷² ⁷³ ⁷⁴

INTEROCCLUSAL SPACE AND RETENTION

The retention of cement-retained prostheses is affected by many factors such as taper of abutment, surface area and height, surface roughness, and type of cement.⁷⁵ 18-23 The implant abutment should be of sufficient height so as to acquire adequate retention for cement retained prosthesis.⁷⁶ 12 In cases, where the interocclusal space is less than 4 mm then a screw retained prosthesis should be considered to achieve the required retention, this will in turn help to avoid any preprosthetic surgery to increase the restorative space.⁷⁷ ⁷⁸ ⁷⁹ ⁸⁰ ⁸¹

Cement selection is a crucial factor in cement retained prostheses. The cement is generally selected based on the type of prostheses given provisional or permanent.^{24,25,26} The luting agents should be strong enough to prevent dislodgment of prostheses and also weak enough to help easy retrieval of prostheses without causing any complication. Behr et al, in his study noted that zinc phosphate would leave some powdery remnants that was still present after excess cement removal. The easiest to remove was zinc oxide-eugenol cement and it would have cleanest surface.²⁷ TempBond is a eugenol free cement and has a characteristic to dissolve upon contact with fluid which leads to fewer complications.²⁸

Duralon a type of polycarboxylate cement contains fluoride which is known to cause etching of titanium when used in acidic environment causes corrosion on implant surface. Polycarboxylate cements are not advised for luting to implants.^{29,30}

Clinical Significance:

Cement retained prostheses are contraindicated in malaligned or limited interocclusal space; a screw retained prostheses should be considered. If lithium disilicate crowns are to be luted then the use of permanent resin cement should be considered. Otherwise, TempBond is the choice for easier retrievability of the prostheses.

RESIDUAL EXCESS CEMENT

Residual excess cement plays an important role in peri-implant inflammation according to American Academy of Periodontology. Korsch et al, in his study

found that larger diameter implants had excess residual cement. This maybe¹⁰⁸ because most of larger diameter implants were used in posterior¹⁰⁹ region and inability¹¹⁰ to access it to maintain hygiene.³¹ Excess cement¹¹¹ in the per-implant¹¹² tissue will act as a calculus¹¹³ and thus will make the implant surface rough and help adherence of bacteria.³²

Clinical Significance:

Residual cement is bound to cause peri-implant inflammation either in a short period or long¹¹⁴ period of time¹¹⁵. Removal of abutment¹¹⁶ is the only method to successfully remove the cement use of titanium scalers for a non-surgical debridement and should be left to heal for a period of¹¹⁷ 3-4 weeks before considering a surgical approach.

BIOLOGIC COMPLICATIONS

Implant biology is completely¹¹⁸ different than that of a natural tooth. Supracrestal collagen fibers are generally responsible for holding the soft tissue around the tooth which¹¹⁹ insert into the cementum.³³ The arrangement of these collagen fibers is such that it compartmentalizes the infection¹²⁰ in a particular area and prevents it¹²¹ spread.³⁴ Implant¹²² does not have such arrangement of fibers instead a sling of circumferential fibers¹²³ surround it and¹²⁴ hence the chances of spreading of infection increases¹²⁵ any diseases entering will affect the entire implant.²⁹

Clinical Significance:

Residual cement is bound to cause peri-implant inflammation either in a short period or long¹²⁶ period of time¹²⁷. Removal of abutment¹²⁸ is the only method to

successfully remove the cement use of titanium scalers for a non-surgical debridement and should be left to heal for a period of 3-4 weeks¹²⁹ before considering a surgical approach.

TECHNICAL COMPLICATIONS ASSOCIATED WITH SCREW RETENTION:

The implant screw is under constant stress and¹³⁰ hence more technical complications occur. Many authors report screw loosening and fracture to be a common consequence.^{3,4,10} Sailer et al¹³¹ in his study over a period of 5 years¹³² reported screw loosening to be more common in screw retained¹³⁴ prostheses while fracture was more often in cement retained¹³⁵ prostheses.³⁵ Assenza et al,¹³⁶ reported that the old screw must be replaced with a new screw, rather than retightening of the old one because this may cause fatigue fracture since there is a chance of deformation of screw¹³⁷ due to previous load.³⁶

Clinical Significance:

Although screw loosening and screw fracture are most commonly seen¹³⁸ technical complications¹³⁹ many of¹⁴⁰ current literature shows no difference between either mode of retention. New¹⁴¹ screw must be placed rather than retightening of old one.¹⁴²¹⁴³

RETRIEVABILITY AND LONG-TERM COMPLICATION

Screw retained prostheses has a major advantage,¹⁴⁴¹⁴⁵ since any biologic or technical complication occur¹⁴⁶ it might be necessary for oral hygiene maintenance, necessary restoration servicing it easier to retrieve as compared to cement retained¹⁴⁸¹⁴⁹ .⁴ In case of partial edentulousness, if the adjacent teeth¹⁵⁰

have poor prognosis and future possibility of extraction should be kept in mind.
 In such times, if there rises a situation that the use of previous implant is to be made then the use of screw retained prostheses is much better because of more successful chance of retrievability than cement retained.

Clinical Significance:

Screw retained prostheses will help in easier management of complication should any arise.

Conclusion

There are inherent advantages and disadvantages to both screw retained and cement retained prostheses the literature has shown that neither can be used for every clinical scenario, it is upto the clinician to make the most by the evidence based in literature. The major factors to be considered are retrievability, biologic, mechanical, long term planning and use of different abutment in cases of angled implant placement for the use of either screw or cement retained implant prostheses.

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cement-implant-retained restorations: An experimental study in the beagle.
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1.	vs.	Comma Misuse within Clauses	Correctness
2.	, and	Comma Misuse within Clauses	Correctness
3.	occur → occurs	Faulty Subject-Verb Agreement	Correctness
4.	are used	Passive Voice Misuse	Clarity
5.	The choice	Determiner Use (a/an/the/this, etc.)	Correctness
6.	, and	Punctuation in Compound/Complex Sentences	Correctness
7.	screw retained → screw-retained	Misspelled Words	Correctness
8.	cement retained → cement-retained	Misspelled Words	Correctness
9.	the prosthesis	Determiner Use (a/an/the/this, etc.)	Correctness
10.		Intricate Text	Clarity
11.	This	Intricate Text	Clarity
12.	the implant	Determiner Use (a/an/the/this, etc.)	Correctness
13.	been noted	Passive Voice Misuse	Clarity
14.	the present	Determiner Use (a/an/the/this, etc.)	Correctness
15.	literature,	Comma Misuse within Clauses	Correctness
16.	, and	Comma Misuse within Clauses	Correctness
17.		Intricate Text	Clarity
18.	cement retained → cement-retained	Misspelled Words	Correctness

19.	an excess	Determiner Use (a/an/the/this, etc.)	Correctness
20.	cement → glue	Word Choice	Engagement
21.	major → significant	Word Choice	Engagement
22.	easier,	Punctuation in Compound/Complex Sentences	Correctness
23.	easier → more comfortable, more natural, more relaxed, more effortless	Word Choice	Engagement
24.	<i>is most often found</i>	Passive Voice Misuse	Clarity
25.	major → significant	Word Choice	Engagement
26.	are → is	Faulty Subject-Verb Agreement	Correctness
27.	very difficult → tough, challenging, complicated	Word Choice	Engagement
28.	in attaining → to attain	Incorrect Verb Forms	Correctness
29.	a previous	Determiner Use (a/an/the/this, etc.)	Correctness
30.	In order to → To	Wordy Sentences	Clarity
31.	outcome,	Comma Misuse within Clauses	Correctness
32.	good → proper	Word Choice	Engagement
33.	, and	Punctuation in Compound/Complex Sentences	Correctness
34.	<i>is adequately achieved</i>	Passive Voice Misuse	Clarity
35.	, which	Punctuation in Compound/Complex Sentences	Correctness

36.	an implant	Determiner Use (a/an/the/this, etc.)	Correctness
37.	the bone	Determiner Use (a/an/the/this, etc.)	Correctness
38.	a considerable	Determiner Use (a/an/the/this, etc.)	Correctness
39.	, and	Comma Misuse within Clauses	Correctness
40.	be taken	Passive Voice Misuse	Clarity
41.	cement → glue, adhesive	Word Choice	Engagement
42.		Intricate Text	Clarity
43.	This	Intricate Text	Clarity
44.	the anterior	Determiner Use (a/an/the/this, etc.)	Correctness
45.	, which	Punctuation in Compound/Complex Sentences	Correctness
46.	the anterior	Determiner Use (a/an/the/this, etc.)	Correctness
47.	This	Intricate Text	Clarity
48.	the presence	Determiner Use (a/an/the/this, etc.)	Correctness
49.	the implant, or an implant	Determiner Use (a/an/the/this, etc.)	Correctness
50.	an ideal → a perfect, an perfect	Word Choice	Engagement
51.	preangled → pre angled, pre-angled, angled	Misspelled Words	Correctness
52.	This	Intricate Text	Clarity

53.	<i>This</i>	Intricate Text	Clarity
54.	cement retained → cement-retained	Misspelled Words	Correctness
55.	<i>be placed</i>	Passive Voice Misuse	Clarity
56.	, and	Punctuation in Compound/Complex Sentences	Correctness
57.	<i>be obtained</i>	Passive Voice Misuse	Clarity
58.	<i>be easily obtained</i>	Passive Voice Misuse	Clarity
59.	the use	Determiner Use (a/an/the/this, etc.)	Correctness
60.	, which	Punctuation in Compound/Complex Sentences	Correctness
61.	upto → up to	Misspelled Words	Correctness
62.		Intricate Text	Clarity
63.	<i>This</i>	Intricate Text	Clarity
64.	lead → pressure, amount	Word Choice	Engagement
65.	en → to	Wrong or Missing Prepositions	Correctness
66.	the lateral, or a lateral	Determiner Use (a/an/the/this, etc.)	Correctness
67.	, which	Punctuation in Compound/Complex Sentences	Correctness
68.	which could lead → , leading	Wordy Sentences	Clarity
69.	Restorative	Wordy Sentences	Clarity
70.	, and	Punctuation in Compound/Complex Sentences	Correctness

71.	<i>be achieved</i>	Passive Voice Misuse	Clarity
72.	screw retained → screw-retained	Misspelled Words	Correctness
73.	achieve → make	Word Choice	Engagement
74.	in spite of → despite	Wordy Sentences	Clarity
75.	the abutment, or an abutment	Determiner Use (a/an/the/this, etc.)	Correctness
76.	implant-abutment	Misspelled Words	Correctness
77.	so as to → to	Wordy Sentences	Clarity
78.	cement retained → cement-retained	Misspelled Words	Correctness
79.	screw retained → screw-retained	Misspelled Words	Correctness
80.	proprosthetic → pre-prosthetic, pre prosthetic	Misspelled Words	Correctness
81.		Intricate Text	Clarity
82.	cement retained → cement-retained	Misspelled Words	Correctness
83.	cement → adhesive, glue	Word Choice	Engagement
84.	enough → sufficient	Word Choice	Engagement
85.		Intricate Text	Clarity
86.	et al → et al.	Comma Misuse within Clauses	Correctness
87.	study,	Comma Misuse within Clauses	Correctness
88.	was → were	Faulty Subject-Verb Agreement	Correctness
89.		Intricate Text	Clarity

90.	, and	Punctuation in Compound/Complex Sentences	Correctness
91.	the cleanest	Determiner Use (a/an/the/this, etc.)	Correctness
92.	, a	Punctuation in Compound/Complex Sentences	Correctness
93.	the acidic	Determiner Use (a/an/the/this, etc.)	Correctness
94.	environment,	Punctuation in Compound/Complex Sentences	Correctness
95.	the implant	Determiner Use (a/an/the/this, etc.)	Correctness
96.	cements → cement, types of cement, blocks of cement	Incorrect Noun Number	Correctness
97.	<i>are not advised</i>	Passive Voice Misuse	Clarity
98.	<i>are contraindicated</i>	Passive Voice Misuse	Clarity
99.	screw retained → screw-retained	Misspelled Words	Correctness
100.	<i>be considered</i>	Passive Voice Misuse	Clarity
101.	<i>be luted</i>	Passive Voice Misuse	Clarity
102.	luted,	Punctuation in Compound/Complex Sentences	Correctness
103.	an important → a vital, an essential	Word Choice	Engagement
104.	, according	Punctuation in Compound/Complex Sentences	Correctness
105.	the American	Determiner Use (a/an/the/this, etc.)	Correctness

106.	et al → et al.	Comma Misuse within Clauses	Correctness
107.	study,	Comma Misuse within Clauses	Correctness
108.	maybe → may be	Confused Words	Correctness
109.	the posterior	Determiner Use (a/an/the/this, etc.)	Correctness
110.	the inability	Determiner Use (a/an/the/this, etc.)	Correctness
111.	cement → glue, adhesive	Word Choice	Engagement
112.	per-implant → peri-implant	Confused Words	Correctness
113.	a calculus	Determiner Use (a/an/the/this, etc.)	Correctness
114.	a long	Determiner Use (a/an/the/this, etc.)	Correctness
115.	period of time → period, time	Wordy Sentences	Clarity
116.	the abutment	Determiner Use (a/an/the/this, etc.)	Correctness
117.	a period of	Wordy Sentences	Clarity
118.	completely → entirely	Word Choice	Engagement
119.	, which	Punctuation in Compound/Complex Sentences	Correctness
120.	the infection → the infection	Improper Formatting	Correctness
121.	it → its	Pronoun Use	Correctness
122.	The implant, or An implant	Determiner Use (a/an/the/this, etc.)	Correctness
123.	fibers → cords	Word Choice	Engagement

124.	, and	Punctuation in Compound/Complex Sentences	Correctness
125.	increases → increase	Faulty Subject-Verb Agreement	Correctness
126.	a long	Determiner Use (a/an/the/this, etc.)	Correctness
127.	period of time → period, time	Wordy Sentences	Clarity
128.	the abutment	Determiner Use (a/an/the/this, etc.)	Correctness
129.	a period of	Wordy Sentences	Clarity
130.	, and	Punctuation in Compound/Complex Sentences	Correctness
131.	et al → et al.	Comma Misuse within Clauses	Correctness
132.	over a period of → over, for	Wordy Sentences	Clarity
133.	years,	Punctuation in Compound/Complex Sentences	Correctness
134.	screw retained → screw-retained	Misspelled Words	Correctness
135.	cement retained → cement-retained	Misspelled Words	Correctness
136.	et al → et al.	Comma Misuse within Clauses	Correctness
137.	the screw	Determiner Use (a/an/the/this, etc.)	Correctness
138.	<i>are most commonly seen</i>	Passive Voice Misuse	Clarity
139.	complications,	Punctuation in Compound/Complex Sentences	Correctness
140.	of	Wrong or Missing Prepositions	Correctness

141.	A new	Determiner Use (a/an/the/this, etc.)	Correctness
142.	the retightening	Determiner Use (a/an/the/this, etc.)	Correctness
143.	the old	Determiner Use (a/an/the/this, etc.)	Correctness
144.	major → significant	Word Choice	Engagement
145.	advantage,	Punctuation in Compound/Complex Sentences	Correctness
146.	occur → occurs	Faulty Subject-Verb Agreement	Correctness
147.	easier → more comfortable	Word Choice	Engagement
148.	cement retained → cement-retained	Misspelled Words	Correctness
149.		Intricate Text	Clarity
150.	the case	Determiner Use (a/an/the/this, etc.)	Correctness
151.	a poor	Determiner Use (a/an/the/this, etc.)	Correctness
152.	the future	Determiner Use (a/an/the/this, etc.)	Correctness
153.		Intricate Text	Clarity
154.	the previous	Determiner Use (a/an/the/this, etc.)	Correctness
155.	be made	Passive Voice Misuse	Clarity
156.	screw retained → screw-retained	Misspelled Words	Correctness
157.	a more, or the more	Determiner Use (a/an/the/this, etc.)	Correctness

		etc.)	
158.	cement retained → cement-retained	Misspelled Words	Correctness
159.	complication → complications	Incorrect Noun Number	Correctness
160.	screw retained → screw-retained	Misspelled Words	Correctness
161.	cement retained → cement-retained	Misspelled Words	Correctness
162.	<i>be used</i>	Passive Voice Misuse	Clarity
163.	upte → up to	Misspelled Words	Correctness
164.	evidence based → evidence-based	Misspelled Words	Correctness
165.	literature → research, writing	Word Choice	Engagement
166.	major → significant	Word Choice	Engagement
167.	, and	Punctuation in Compound/Complex Sentences	Correctness
168.	use → purpose	Word Choice	Engagement
169.	the use of	Wordy Sentences	Clarity
170.	cement retained → cement-retained	Misspelled Words	Correctness
171.	REFERENCES → REFERENCES	Misspelled Words	Correctness
172.	implant-supported	Misspelled Words	Correctness
173.	implant-supported	Wordy Sentences	Clarity
174.	Mutinelli → Martinelli	Misspelled Words	Correctness
175.	implant-supported	Misspelled Words	Correctness

176.	implant-supported	Wordy Sentences	Clarity
177.	randomised → randomized	Mixed Dialects of English	Correctness
178.	lorio → Lorio, lorio	Misspelled Words	Correctness
179.	implant-supported	Misspelled Words	Correctness
180.	metal single → single metal	Misplaced Words or Phrases	Correctness
181.	The passivity	Determiner Use (a/an/the/this, etc.)	Correctness
182.	marginal → limited	Word Choice	Engagement
183.	KX → XK	Misspelled Words	Correctness
184.	a cement	Determiner Use (a/an/the/this, etc.)	Correctness
185.	<i>Rajan M, Gunaseelan R. Fabrication of a cement- and screw-retained implant prosthesis.</i>	Incomplete Sentences	Correctness
186.	implant-supported	Misspelled Words	Correctness
187.	in fluencing → influencing	Confused Words	Correctness
188.	extracoronaral → extra coronal, extracorporeal	Misspelled Words	Correctness
189.	cements → types of cement, blocks of cement	Incorrect Noun Number	Correctness
190.	Simon → Simons	Confused Words	Correctness
191.	of the effect	Wordy Sentences	Clarity
192.	cements → cement, types of cement, blocks of cement	Incorrect Noun Number	Correctness

193.	Purione → Purine	Misspelled Words	Correctness
194.	The influence	Improper Formatting	Correctness
195.	the literature	Determiner Use (a/an/the/this, etc.)	Correctness
196.	<i>In order to achieve a stable and predictable</i>	About Us | dentalbrigade.com http://dentalbrigade.com/about-us/	Originality
197.	<i>There are inherent advantages and disadvantages to both</i>	Type B's Guide to Living in a Type A's World | Small ... https://sbdc.wvu.edu/type-bs-guide-living-type-world	Originality
198.	<i>screw- versus cement-retained porcelain fused to metal single crowns: SEM fractographic analysis.</i>	Fracture resistance of implant-supported screw- versus ... https://www.sciencedirect.com/science/article/pii/S0109564106000388	Originality
199.	<i>Michalakakis KX, Hirayama H, Garefis PD. Cement-retained versus screw-retained implant restorations: A critical review. Int J Oral Maxillofac Implants 2003; 18:719-28.</i>	Principles of screw - retained and cement - retained fixed ... http://www.jidonline.com/article.asp?issn=2229-5194;year=2014;volume=4;issue=3;spage=123;epage=129;aulast=Shetty	Originality
200.	<i>Int J Oral Maxillofac Implants 2009; 24(Suppl</i>	Principles of screw - retained and cement - retained fixed ... http://www.jidonline.com/article.asp?issn=2229-5194;year=2014;volume=4;issue=3;spage=123;epage=129;aulast=Shetty	Originality
201.	<i>Brunski JB. Biomaterials and biomechanics in dental implant design. Int J Oral Maxillofac Implants 1988;3:85-97.</i>	Principles of screw - retained and cement - retained fixed ... http://www.jidonline.com/article.asp?issn=2229-5194;year=2014;volume=4;issue=3;spage=123;epage=129;aulast=Shetty	Originality

202.	<i>KD. The relationship between retention and convergence angle in cemented veneer crowns. Acta Odontol Scand. 1955; 13:35–40.</i>	Principles of screw - retained and cement - retained fixed ... http://www.jidonline.com/article.asp?issn=2229-5194;year=2014;volume=4;issue=3;spage=123;epage=129;aulast=Shetty	Originality
203.	<i>Kaufman EG, Coelho AB, Colin L. Factors influencing the retention of cemented gold castings. J Prosthet Dent. 1961; 11:487–502.</i>	Principles of screw - retained and cement - retained fixed ... http://www.jidonline.com/article.asp?issn=2229-5194;year=2014;volume=4;issue=3;spage=123;epage=129;aulast=Shetty	Originality
204.	<i>The effect of surface roughness of crown preparations on retention of cemented castings. J Prosthet Dent. 1987; 58:292-6. Breeding LC, Dixon DL, Bogacki MT, Tietge JD. Use of luting agents with an implant system. Part</i>	Principles of screw - retained and cement - retained fixed ... http://www.jidonline.com/article.asp?issn=2229-5194;year=2014;volume=4;issue=3;spage=123;epage=129;aulast=Shetty	Originality
205.	<i>Linkevicius T, Vindasiute E, Puisys A, Linkeviciene L, Maslova N, Puriene A. The influence of the cementation margin position on the amount of undetected cement. A prospective clinical study. Clin Oral Implants Res 2013; 24:71-6.</i>	Principles of screw - retained and cement - retained fixed ... http://www.jidonline.com/article.asp?issn=2229-5194;year=2014;volume=4;issue=3;spage=123;epage=129;aulast=Shetty	Originality
206.	<i>Abrahamsson I, Persson LG, Berglundh T. Spontaneous progression of ligature induced peri-implantitis at implants with different surface characteristics. An experimental study in dogs II: Histological observations. Clin Oral Implants Res</i>	Histological characteristics of advanced peri-implantitis ... https://journalimplantdent.springeropen.com/articles/10.1186/s40729-020-00208-8	Originality
207.	<i>Sailer I, Mühlemann S, Zwahlen M, Hämmerle CH, Schneider D. Cemented and</i>	Principles of screw - retained and cement - retained fixed ... http://www.jidonline.com/article.asp?issn=2229-5194;year=2014;volume=4;issue	Originality

[=3;spage=123;epage=129;aulast
=Shetty.](#)

208. *implant reconstructions: A systematic review of the survival and complication rates. Clin Oral Implants Res 2012;23 Suppl 6:163-201. Assenza B, Artese L, Scarano A, Rubini C, Perrotti V, Piattelli M, et al. Screw vs. cement-implant-retained restorations: An experimental study in the beagle. Part*

Principles of screw - retained and cement - retained fixed ...
[http://www.jidonline.com/article.asp?issn=2229-5194;year=2014;volume=4;issue=3;spage=123;epage=129;aulast=Shetty.](http://www.jidonline.com/article.asp?issn=2229-5194;year=2014;volume=4;issue=3;spage=123;epage=129;aulast=Shetty)

Originality

Thesis manuscript

by MIDSR Dental

General metrics

23,219

characters

3,640

words

178

sentences

14 min 33 secreading
time**28 min 0 sec**speaking
time

Score

**59**

Writing Issues

293

Issues left

137

Critical

156Advanced

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Writing Issues

191	Correctness	
24	Misspelled words	
3	Improper formatting	
5	Faulty subject-verb agreement	
40	Punctuation in compound/complex sentences	
4	Wrong or missing prepositions	
66	Determiner use (a/an/the/this, etc.)	
1	Incomplete sentences	
7	Incorrect noun number	
26	Comma misuse within clauses	
1	Pronoun use	
2	Confused words	
3	Misplaced words or phrases	
2	Mixed dialects of english	
1	Misuse of modifiers	
5	Incorrect verb forms	
1	Misuse of quantifiers	
83	Clarity	
14	Hard-to-read text	
25	Wordy sentences	
16	Unclear sentences	
24	Passive voice misuse	
4	Intricate text	
19	Engagement	

19 Word choice 

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rare words

Word Length

5.1

Measures average word length

characters per word

Sentence Length

20.4

Measures average sentence length

words per sentence

Thesis manuscript

COMPARATIVE EVALUATION OF MICROLEAKAGE OF ZINC OXIDE EUGENOL AND ENDOFLAS¹ AS OBTURATING MATERIALS USING DIFFERENT ROOT CANAL IRRIGANTS IN PRIMARY TEETH: AN IN VITRO STUDY

Abstract:

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Objective: The objective of this study was to compare and evaluate apical microleakage of zinc oxide eugenol and Endoflas as obturating materials using different root canal irrigants in primary teeth.²

Materials and methods: Eighty extracted primary anterior teeth were divided randomly into 4³ groups according to different irrigants and obturating materials used. Group 1 (ZOE+ NaOCl), Group 2 (ZOE + NaOCl + EDTA), Group 3 (Endoflas + NaOCl), Group 4 (Endoflas + NaOCl + EDTA). Cleaning and shaping of the tooth was done⁴ followed⁵ by obturation⁶ with zinc oxide eugenol and Endoflas in respective groups. Samples were immersed in 2% methylene blue dye solution and stored in the solution for 24 hours. The roots were split longitudinally in⁷ two halves and observed under stereomicroscope⁸. Apical microleakage⁹ measured from the apex to the most coronal extent of dye penetration.

Results: The highest dye penetration was recorded for teeth filled with zoe¹⁰, Group 1 (ZOE+ NaOCl) with mean values 1.924 ± 0.925 . Endoflas Group 4 (Endoflas + NaOCl + EDTA) showed the lowest dye penetration with mean values of 0.901 ± 0.255 . Comparison between the groups showed significant difference¹¹ when zoe and Endoflas groups were compared¹² ($p < 0.001$).¹³ The result showed no difference between two¹⁴ Endoflas groups ($p = 1.000$). Minimum microleakage was found in Group 4 (Endoflas + NaOCl + EDTA)

Conclusion: Endoflas FS exhibits less apical microleakage as compared to¹⁵ zinc oxide eugenol as an obturating material in primary teeth. And hence, Endoflas could be a potential alternative to zinc oxide eugenol with better sealing ability as an obturating material in primary teeth.

Introduction

Pulpectomy¹⁶ is a treatment modality indicated¹⁷ for primary teeth with irreversible pulpitis or non-vital pulp with or without associated infection. The aim of this treatment is¹⁸ to retain teeth with irreversible pulp pathosis in a symptom free state¹⁹ until they are lost naturally during the transition from primary to permanent dentition, thus avoiding the tooth loss²⁰²¹. A clean root canal system along with a three-dimensional seal is the clinician's path to success. The contents of root²² canal system are removed during the biomechanical preparation. Throughout the instrumentation, irrigation is unavoidable. It is a simple procedure by which the loose, necrotic, contaminated materials are flushed away.

Elimination of microorganisms from infected root canals is a difficult task. Numerous measures have been described to reduce the numbers²³ of root canal microorganisms, including the use of²⁴ various instrumentation techniques, irrigation regimens and²⁵ intra-canal medicaments. Irrigants can augment mechanical debriment²⁶ by flushing out debris, dissolving tissue and²⁷ disinfecting

300 ²⁸ root canal system. An optimal irrigant should have all or most ²⁹ of the positive characteristics but none of the negative or harmful properties. None of the available irrigating solutions can be regarded as optimal. Using a combination of products in the correct irrigation sequence contributes to a successful treatment outcome.¹

301 The hermetic sealing of the root canal space is one of the objectives ³⁰ in root canal therapy.² The most common cause of failure involving endodontic ³¹ therapy can be attributed to the lack of the apical seal. Another major requirement for a successful root canal treatment of primary teeth is that the root canal filling material should be radiopaque, nontoxic to the periapical tissue and tooth germ, easy to insert, non-shrinkable ³² and should have disinfectant properties.³ None of the materials currently available meet all these criteria.⁴ Since long zinc oxide eugenol has been routinely used for filling root canals of primary teeth with a success rate of 65% to 85%.⁵ However this material is known to be irritating to the periapical tissues, does not resorb at the same pace as the roots ³⁴ and can cause necrosis of bone and cementum.⁶ In the recent ³⁶ past a material containing zinc oxide eugenol, iodoform ³⁷ and calcium hydroxide was introduced in ³⁸ south ³⁹ America with the commercial name Endoflas.⁷ It is a material that encompasses the desirable properties of zinc oxide eugenol, calcium hydroxide ⁴⁰ and iodoform. Even materials like zinc oxide eugenol and Endoflas show varying levels of microleakage as obturating ⁴¹ materials.

One of the reasons for microleakage is ⁴² smear ⁴³ layer. Use of effective irrigants may help in decreasing microleakage and thereby improving the sealing ability of these obturating materials. ⁴⁴ Different irrigation protocols have been introduced to remove the smear layer during root canal treatment. These irrigation regimens can create dentinal surfaces which are very different

structurally. The ideal purpose is to create a particular surface of dentin which is more suitable for the specific obturating material used in the obturation of the root canal system.

Many studies have shown that combination of sodium hypochlorite and EDTA is more efficacious to remove smear layer and prevent apical microleakage than using these irrigants alone. Studies showed that 3% sodium hypochlorite is as efficient as 5% and more suitable to use in children considering its harmful effects. Studies showed that 17% EDTA solution when used as an irrigant causes erosion of dentinal tubules and dentinal structures especially in primary teeth with lower mineral content. To avoid this harmful effect of EDTA solution on dentinal tubules, lower concentration of EDTA solution was suggested. Considering these factors, we have used combination of 3% sodium hypochlorite and 10% EDTA to remove smear layer and reduce apical microleakage and so as to improve sealing ability of obturating materials which improves overall success of pulpectomy.

303 | Hence, this study was undertaken to evaluate and compare microleakage of zinc oxide eugenol and Endoflas as primary root canal filling materials using normal saline, 3% sodium hypochlorite and 10 % EDTA as root canal irrigants.

304 | Materials and Methods:

We carried out this in vitro experimental study at Department of Pediatric and Preventive Dentistry, after gaining clearance from Institutional Ethical committee, letter no. MIDSR/STU/PG/560/957/2018

· Inclusion Criteria:

1. Extracted human primary anterior teeth.
2. The teeth should be without any cracks, grooves, resorption and calcification.
3. Teeth should have more than two-third of original root length.

· Exclusion Criteria:

Teeth were excluded if presence⁷³ of:

1. Root fracture.
2. Root caries.
3. Extreme caries.
4. Presence of Extreme calcification.
5. Root length less than two-third of original⁷⁴ length.
6. Internal resorption.

G) Preparation of specimens:

The external surface of each selected teeth⁷⁵ was cleaned with cures. Then the teeth were disinfected using sodium hypochlorite and stored in deionized water until beginning⁷⁶ of the experiment.

H) Methodology:

Eighty extracted primary anterior teeth⁷⁷ were selected. The teeth were divided into four groups according to obturating materials and root canal irrigants used: (Fig.2)

GROUP 1: Zinc oxide eugenol irrigated with Normal saline + 3% Sodium hypochlorite

GROUP 2: Zinc oxide eugenol irrigated with Normal saline + 3% Sodium hypochlorite + 10% EDTA GROUP 3: Endoflas irrigated with Normal saline + 3% Sodium hypochlorite

GROUP 4: Endoflas irrigated with Normal saline + 3% Sodium hypochlorite + 10% EDTA

TECHNIQUE: All the teeth from 4 groups received standardized instrumentation procedures. The clinical crown was maintained⁷⁸ to assist hand⁷⁹ holding each tooth. Access to the pulp chamber was obtained⁸⁰ with no. 2 and no. 4 high-speed round burs. Working length was measured from the IOPA radiograph and

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kept 1 mm short of the apex.^{82,83} Biomechanical preparation of each specimen was done using K and H hand files. Each canal was enlarged up to size 40-45.⁸¹

Irrigation Protocol: After each instrument size, copious irrigation was performed as per different irrigation protocol in each group. For Group 1, all specimens were irrigated with normal saline followed by sodium hypochlorite as a final irrigant for three minutes.⁹ For Group 2, all the specimens were irrigated⁸⁵ copiously with normal saline followed by sodium hypochlorite and the EDTA as a final irrigant for three minutes.⁹ For Group 3, irrigation protocol was same as group 1 i.e. normal saline followed by sodium hypochlorite and for Group 4 same as group 2 i.e. normal saline followed by sodium hypochlorite and EDTA as a final irrigant for three minutes.⁹ After irrigation, all the specimens from the respective groups were dried using paper points and obturation of the specimens were done using zinc oxide eugenol and Endoflas according to four different groups respectively .

Obturation of the specimens:

After drying⁹⁷ of the specimens with the help of paper points, all the specimens were obturated according to respective group and materials using lentulo spirals paste carrier mounted on slow speed handpiece. Standardized obturation procedures for the respective materials were followed.¹⁰ complete obturation of canal space in all the specimens till the working length was ensured and radiograph was taken for each tooth to ensure that obturating materials filled the apical third. After completion of obturation in each specimen, the access cavity was sealed with the help of Tempfil, then wrapped in wet gauze to maintain a humid environment and stored in individual coded glasses at 37°C in an incubator to ensure setting of the obturation material.¹¹

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Root surfaces of all the specimens in the experimental groups (groups 1 to 4) were painted with 2 coats of nail polish, except 1 mm from the apical foramen. Then, all teeth were suspended into 2% methylene blue dye for 24 hours in individual glass vials. Later, the specimens were removed from the dye solution, washed and air dried before splitting the teeth for dye evaluation. Each tooth was splitted longitudinally in a labiolingual direction using diamond disc and micromotor in a direction parallel to the long axis of the tooth with the help of diamond disc. The half showing more microleakage was considered for stereomicroscopic evaluation. The apical third part of the each splitted specimen was then subjected to the stereomicroscopic evaluation with a magnification of 10x. The presence of dye penetration at the interface of the obturation material and inner layer of the root was considered as an indicator of microleakage. Linear dye penetration from apex to the most coronal extent of dye penetration was measured in millimetres. Dye penetration for each specimen was evaluated by a single observer. The score for each specimen was noted and data obtained was subjected to statistical analysis.

Results:

The microleakage score for 20 study samples from each group were recorded and the mean value was calculated.

The mean microleakage score obtained for group 1 was 1.924 and standard deviation ± 0.925 . The mean microleakage score obtained for group 2 was 1.823 and standard deviation ± 0.977 . The mean microleakage score obtained for group 3 was 0.908 and standard deviation ± 0.277 . The mean microleakage score obtained for group 4 was 0.901 and standard deviation ± 0.255 . Mean microleakage values for all groups were compared between all study groups by using One way Analysis of variance 'F' test (Table 5 and Graph 1) followed by

intergroup comparison using Tukey's post hoc test (Table 6 and Graph 2).¹³⁷ In the present study, $p < 0.001$ was considered as the level of significance.

Means of microleakage values were calculated using One-way ANOVA 'F' test,¹³⁸ it was found that highly statistical significant difference exists among four¹⁴⁰ groups. Highest microleakage was found in Group 1 (1.924 ± 0.925) followed by Group 2 (1.823 ± 0.977) followed by Group 3 (0.908 ± 0.277) followed by Group 4 (0.901 ± 0.255) with p value < 0.001 and the Analysis of Variance F value 12.881 (Table 5 & Graph 1)¹⁴¹¹⁴²¹⁴³

On pairwise comparison of microleakage between all four groups using Tukey's post hoc test, it was found that: When group 1 was compared¹⁴⁶ with other groups-

- Group 1 have higher microleakage than Group 2 but¹⁴⁷ the difference is not statistically significant ($p = 0.968$)
- Group 1 have higher microleakage than group 3 and¹⁴⁸ the difference was found¹⁴⁹ to be highly statistically significant ($p < 0.001$)
- Group 1 have higher microleakage than group 4 and¹⁵⁰ the difference was highly statistically significant ($p < 0.001$)

When group 2 was compared¹⁵¹ with other groups-

- Group 2 have higher microleakage than group 3 and¹⁵² the difference was statistically significant ($p < 0.001$)
- Group 2 have higher microleakage than the group 4¹⁵³ and¹⁵⁴ the difference was statistically significant ($p < 0.001$)

When group 3 was compared¹⁵⁵ with other groups-

- Group 3 have higher microleakage than the group 4¹⁵⁶ but¹⁵⁷ the difference was not found¹⁵⁸ to be statistically significant ($p = 1.000$)

Discussion:

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The three-dimensional obturation of the root canal system is widely accepted as a key factor for successful endodontic therapy. ¹⁵⁹ Schilder states, "The objective of root canal procedures should be the total three-dimensional filling of the root canal and all accessory canals." A three-dimensional well-fitted root canal prevents percolation and microleakage of periapical exudates into the root canal space, prevents reinfection, and creates a favorable biological environment for healing to take place. ¹⁶⁰ ¹⁶¹ The concept of a perfect apical seal has led to search ¹⁶² for filling and sealing materials that are stable, non-irritating and provide ¹⁶³ a flawless seal at the apical foramen.

Even though the main principles used for endodontic therapy of permanent teeth apply also ¹⁶⁴ for primary teeth, certain ¹⁶⁵ criteria of root canal filling materials are different. These criteria include the resorption of root canal filling material with a similar rate as the physiological root resorption of the primary root. This ¹⁶ contraindicates the use of solid or semi-solid core materials used to fill root canals of permanent teeth. ¹⁴ Another critical difference is the use of cement for root canal filling. In permanent teeth, the cement is used to fill the gaps between the obturation material and the root canal walls. ¹⁶⁷ ¹⁶⁸ The pressure and condensation applied to the core material during obturation of the root canal in permanent teeth results ¹⁶⁹ in better and closer adaptation of cement and gutta percha ¹⁷⁰ to the root canal walls. This condition does not exist in primary teeth, which use a paste as a sole obturation material. Therefore, the sealing ability of the material used to fill a root canal in primary teeth depends mainly on the material's ability to adhere to the root canal walls and the method applied to introduce this material into the root canal.

¹⁷¹ This was the first study to evaluate microleakage between zinc oxide eugenol and endoflas as obturating materials in primary teeth. In the present study, ¹⁷² extracted primary anterior teeth were used ¹⁷³ to decrease anatomic variations. No attempts were made to cut clinical crowns of the teeth to facilitate handling during root canal preparation and ¹⁷⁴ to simulate the clinical situations. ¹⁷⁵ To reduce ¹⁷⁶ variability, random distribution of the teeth into experimental groups was performed after ¹⁷⁷ complete preparation of the root canal. In the present study, ¹⁷⁸ teeth were cut longitudinally to measure the dye penetration. ³¹⁰ Teeth sectioning was performed with a ¹⁷⁹ fine diamond disk, which had ¹⁸⁰ negligible alteration of the root content. This technique is less destructive than the cross-section, which provides knowledge about the adaptation of filling material but ends up with a destroyed sample. The results of the present study were evaluated ¹⁸¹ and ¹⁸² it was found ¹⁸³ that, highly significant difference existed among all the Groups, ¹⁸⁴ Group 4 (Endoflas + NaOCl + EDTA) showed ¹⁸⁵ least microleakage (0.901 ± 0.255) followed by Group 3 (Endoflas + NaOCl) (0.908 ± 0.977) followed by Group 2 (ZOE + NaOCl + EDTA) (1.823 ± 0.977) & Group 1 (ZOE + NaOCl) (1.924 ± 0.925). In intergroup comparison, Group 1 (ZOE + NaOCl) showed higher microleakage compared to Group 2 (ZOE + NaOCl + EDTA) ¹⁸⁶ but the difference was statistically not significant ($p < 0.968$). The change in irrigation protocol and ¹⁸⁷ use of 10% ethylenediaminetetraacetic acid showed ¹⁸⁸ limited effect on ¹⁸⁹ reduction of microleakage. ¹⁹⁰ Zinc oxide eugenol as an obturating material showed higher tendency for microleakage ¹⁹¹ which might be because of the low flow of the zinc oxide eugenol ¹⁹² which results in poor adaptation of the material to the dentinal wall. ¹⁹³ This can be explained by the study conducted by Dultra ¹⁹⁴ F15 ¹⁹⁵ in which zinc oxide eugenol showed higher microleakage ¹⁹⁶ as compared to other materials. This finding was similar to the finding ¹⁹⁷ of ¹⁹⁸ Alacam (1992) ¹⁹⁹ who investigated

the adaptation of ZOE after irrigating the canals of extracted primary canines with different irrigating solutions. They reported insufficient adaptation of the ZOE at different levels of the root canal, which was attributed to shrinkage of ZOE after setting.¹⁶

In intergroup comparison, Group 1 (ZOE + NaOCl) showed higher microleakage compared to Group 3 (Endoflas + NaOCl) which²⁰⁰ was statistically significant ($p < 0.001$). Though no study has been conducted on comparison of zinc oxide eugenol and endoflas²⁰¹ microleakage evaluation in primary teeth, Bawazir et al²⁰² conducted a study to evaluate in vitro apical microleakage of root canal filling materials for primary teeth.²⁰³ They concluded that,²⁰⁴ all the resorbable root canal filling materials used in primary teeth showed apical leakage. The highest apical leakage was recorded for ZOE as compared to other materials used. Another study conducted by Ayer et al²⁰⁵ in which Endoflas FS showed lower apical microleakage as compared to zinc oxide eugenol.²⁰⁶ The composition of the obturating material seems to be the major²⁰⁷ factor related to their flow characteristic but²⁰⁸ their final consistency also has significant²⁰⁹ influence.¹⁹ Zinc oxide eugenol has²¹⁰ lower flow rate than endoflas²¹¹ which might be one of the²¹² reason²¹³ for higher microleakage in zinc oxide eugenol.

In intergroup comparison, Group 1 (ZOE + NaOCl) showed higher microleakage compared to Group 4 (Endoflas + NaOCl + EDTA) and²¹⁴ the difference was statistically significant ($p < 0.001$). The reason for the lower microleakage in the²¹⁵ Group 4 as compare to group 1 can be attributed to the fact that,²¹⁶ Endoflas²¹⁷ when used along with NaOCl and EDTA shows²¹⁸ lower contact angle between²¹⁹ dentin²²⁰ surface and the material²²¹ which gives better sealing ability to the²²² material.²²³ This can be explained by the study conducted by Mulay et al²²⁴ 20²²⁵ which²²⁶ showed²²⁷ wetting ability of various root canal obturating materials after using various irrigants. The reason for lower microleakage in Group 4 as compare^{228,229} to

Group 1 might be because of better adaptation of Endoflas to the root dentin surfaces. In our study, the Group 4 ²³⁰ was treated with both EDTA and NaOCl which ²³¹ may have created an intimate contact of the Endoflas with the dentin surface and the penetration of the material in the dentinal tubules as a result ²³² of the complete removal of the smear layer.

In intergroup comparison, Group 2 (ZOE + NaOCl + EDTA) showed higher microleakage compared to Group 3 (Endoflas + NaOCl) ²³³ and the difference was statistically significant (p<0.001) ²³⁴ The reason behind the higher microleakage in Group 2 as compared to Group 3 might be because of the property of the material used in both the groups. ²³⁵ Many studies have shown that the combined use of Sodium hypochlorite and EDTA helps to remove smear layer ²³⁶ effectively, however ^{237,238} Ximines et al ²³⁹ conducted a study to evaluate the efficacy of combination ²⁴⁰ of NaOCl and EDTA as an irrigating solution for removal of the smear layer from root canals of primary teeth, they concluded that, ²⁴¹ none of the combination ^{242,243} was capable of completely removing the smear layer produced inside the roots of primary teeth which was in accordance with ²⁴⁴ our study. As ²⁴⁵ there is less inorganic contain and more collagen fibres ²⁴⁶ in primary ²⁴⁷ tooth, due to which there is less ^{248,249} chelating effect of EDTA in primary ²⁵⁰ tooth. Thus, EDTA has limited effect ²⁵¹ in reduction ²⁵² of microleakage in primary dentin. ²⁵³ ²⁵⁴

In intergroup comparison, Group 2 (ZOE + NaOCl + EDTA) showed higher microleakage compared to Group 4 (Endoflas + NaOCl + EDTA) ²⁵⁵ and the difference was statistically significant (p<0.001). The probable reason behind this may be because of the flow, particle size, wetting ability and ²⁵⁶ penetration of the material ²⁵⁷ in to ²⁵⁸ dentinal tubules. No study has been found in the literature which assessed apical microleakage between zinc oxide eugenol and endoflas ²⁵⁹ in primary teeth. Endoflas has shown lower microleakage as compare to zinc oxide eugenol because there is less ²⁶⁰ voids formation in the endoflas compare to ²⁶¹

zinc oxide eugenol, forming tight apical seal which restricted the penetration of tracing dye. Also, the consistency of endoflas and mass formation after mixture leads to the flow of the material in to the dentinal tubule which creates good adaptation with the dentinal wall. Hydrophilic property of endoflas permits its use in humid canals. It adheres firmly to the surface of the root canals to provide a good seal.²¹ The use of 10% EDTA did not show significant reduction in microleakage.

In intergroup comparison, Group 3 (Endoflas + NaOCl) showed higher microleakage compared to Group 4 (Endoflas + NaOCl + EDTA) but the difference was not statistically significant (p=1.000). Lower microleakage in Group 4 compare to Group 3 may be because of the smear layer removal by the irrigation protocol used in Group 4 as compare to Group 3. Both the Groups contain same obturating material but there is difference in irrigation regimen used. The results are in accordance with the study conducted by Yuksel B et al who conducted a study to evaluate the wall adaptation and apical microleakage values following the application of various irrigation protocols in primary teeth. They concluded that NaOCl with EDTA could be preferred as an alternative irrigation protocol because of its potential to provide strong wall adaptation and hermetic sealing. It is considered that the well-adapted and leak-proof canal filling following the removal of the entire contents of the smear layer will increase the eventual success rate of root canal treatment in primary teeth.

Even though care was taken to replicate the conditions that exist in the oral cavity as far as possible, constant washing action of saliva, sudden change in temperature and pH could not be duplicated in present study. The quantity and quality of saliva, type of obturation technique, irrigation protocol may also influence the results. Hence further studies are needed to be conducted to

²⁹⁰ evaluate ²⁹¹ effect of these factors on microleakage for the ²⁹² long term success of endodontic treatment in children.

Conclusion:

Endoflas FS has exhibited less apical microleakage ²⁹³ as compared to zinc oxide eugenol as an obturating material in primary teeth. And hence, Endoflas could be a potential alternative to zinc oxide eugenol with better sealing ability as an obturating material in primary teeth.

1.	ENDOFLAS → END OF LAS	Misspelled words	Correctness
2.	<i>Objective: The objective of this study was to compare and evaluate apical microleakage of zinc oxide eugenol and Endoflas as obturating materials using different root canal irrigants in primary teeth.</i>	Hard-to-read text	Clarity
3.	4 → four	Improper formatting	Correctness
4.	was → were	Faulty subject-verb agreement	Correctness
5.	done,	Punctuation in compound/complex sentences	Correctness
6.	followed	Wordy sentences	Clarity
7.	in → into	Wrong or missing prepositions	Correctness
8.	a stereomicroscope	Determiner use (a/an/the/this, etc.)	Correctness
9.	Apical → —apical	Incomplete sentences	Correctness
10.	zoe → Zoe	Misspelled words	Correctness
11.	difference → differences	Incorrect noun number	Correctness
12.	zoe → Zoe	Misspelled words	Correctness
13.	<i>Comparison between the groups showed significant difference when zoe and Endoflas groups were compared ($p < 0.001$).</i>	Unclear sentences	Clarity
14.	the two	Determiner use (a/an/the/this, etc.)	Correctness
15.	as compared to → than	Wordy sentences	Clarity
16.	A pulpectomy	Determiner use (a/an/the/this, etc.)	Correctness

17.	indicated	Wordy sentences	Clarity
18.	This treatment aims	Wordy sentences	Clarity
19.	symptom free → symptom-free	Misspelled words	Correctness
20.	the tooth	Determiner use (a/an/the/this, etc.)	Correctness
21.	<i>The aim of this treatment is to retain teeth with irreversible pulp pathosis in a symptom free state until they are lost naturally during the transition from primary to permanent dentition, thus avoiding the tooth loss.</i>	Unclear sentences	Clarity
22.	the root	Determiner use (a/an/the/this, etc.)	Correctness
23.	numbers → number	Incorrect noun number	Correctness
24.	the use of	Wordy sentences	Clarity
25.	, and	Comma misuse within clauses	Correctness
26.	debriment → debridement, detriment	Misspelled words	Correctness
27.	, and	Comma misuse within clauses	Correctness
28.	the root	Determiner use (a/an/the/this, etc.)	Correctness
29.	of the	Wordy sentences	Clarity
30.	in → of	Wrong or missing prepositions	Correctness
31.	therapy → treatment	Word choice	Engagement
32.	, and	Comma misuse within clauses	Correctness
33.	However,	Punctuation in	Correctness

		compound/complex sentences	
34.	, and	Comma misuse within clauses	Correctness
35.	<i>4 Since long zinc oxide eugenol has been routinely used for filling root canals of primary teeth with a success rate of 65% to 85%.⁵ However this material is known to be irritating to the periapical tissues, does not resorb at the same pace as the roots and can cause necrosis of bone and cementum.</i>	Hard-to-read text	Clarity
36.	past,	Punctuation in compound/complex sentences	Correctness
37.	, and	Comma misuse within clauses	Correctness
38.	<i>a material containing zinc oxide eugenol, iodoform and calcium hydroxide was introduced</i>	Passive voice misuse	Clarity
39.	south → South	Misspelled words	Correctness
40.	, and	Comma misuse within clauses	Correctness
41.	<i>Even materials like zinc oxide eugenol and Endoflas show varying levels of microleakage as obturating materials.</i>	Hard-to-read text	Clarity
42.	the smear	Determiner use (a/an/the/this, etc.)	Correctness
43.	The use	Determiner use (a/an/the/this, etc.)	Correctness
44.	<i>Use of effective irrigants may help in decreasing microleakage and thereby improving the sealing ability of these obturating materials.</i>	Unclear sentences	Clarity
45.	a particular → a distinct	Word choice	Engagement

46.	surface → feeling, character	Word choice	Engagement
47.	which is → that is	Pronoun use	Correctness
48.	<i>The ideal purpose is to create a particular surface of dentin which is more suitable for the specific obturating material used in the obturation of the root canal system.</i>	Hard-to-read text	Clarity
49.	a combination	Determiner use (a/an/the/this, etc.)	Correctness
50.	the smear	Determiner use (a/an/the/this, etc.)	Correctness
51.	<i>Many studies have shown that combination of sodium hypochlorite and EDTA is more efficacious to remove smear layer and prevent apical microleakage than using these irrigants alone.</i>	Hard-to-read text	Clarity
52.	to use in → for	Wordy sentences	Clarity
53.	when	Wordy sentences	Clarity
54.	, when used as an irrigant,	Comma misuse within clauses	Correctness
55.	irrigant → irritant	Confused words	Correctness
56.	, especially	Comma misuse within clauses	Correctness
57.	a lower	Determiner use (a/an/the/this, etc.)	Correctness
58.	a combination	Determiner use (a/an/the/this, etc.)	Correctness
59.	the smear	Determiner use (a/an/the/this, etc.)	Correctness
60.	so as to → to	Wordy sentences	Clarity

61.	the sealing	Determiner use (a/an/the/this, etc.)	Correctness
62.	, which	Punctuation in compound/complex sentences	Correctness
63.	the overall	Determiner use (a/an/the/this, etc.)	Correctness
64.	<i>Considering these factors, we have used combination of 3% sodium hypochlorite and 10% EDTA to remove smear layer and reduce apical microleakage and so as to improve sealing ability of obturating materials which improves overall success of pulpectomy.</i>	Unclear sentences	Clarity
65.	, and	Comma misuse within clauses	Correctness
66.	<i>Hence, this study was undertaken to evaluate and compare microleakage of zinc oxide eugenol and Endoflas as primary root canal filling materials using normal saline, 3% sodium hypochlorite and 10 % EDTA as root canal irrigants.</i>	Hard-to-read text	Clarity
67.	the Department	Determiner use (a/an/the/this, etc.)	Correctness
68.	Dentistry,	Punctuation in compound/complex sentences	Correctness
69.	the Institutional	Determiner use (a/an/the/this, etc.)	Correctness
70.	committee → Committee	Misspelled words	Correctness
71.	, and	Comma misuse within clauses	Correctness
72.	the original	Determiner use (a/an/the/this, etc.)	Correctness
73.			

	the presence	Determiner use (a/an/the/this, etc.)	Correctness
74.	the original	Determiner use (a/an/the/this, etc.)	Correctness
75.	<i>The external surface of each selected teeth was cleaned</i>	Passive voice misuse	Clarity
76.	the beginning	Determiner use (a/an/the/this, etc.)	Correctness
77.	<i>Eighty extracted primary anterior teeth were selected</i>	Passive voice misuse	Clarity
78.	<i>The clinical crown was maintained</i>	Passive voice misuse	Clarity
79.	the hand	Determiner use (a/an/the/this, etc.)	Correctness
80.	<i>Access to the pulp chamber was obtained</i>	Passive voice misuse	Clarity
81.	<i>Each canal was enlarged up</i>	Passive voice misuse	Clarity
82.	protocol → protocols	Incorrect noun number	Correctness
83.	<i>Irrigation Protocol: After each instrument size, copious irrigation was performed as per different irrigation protocol in each group.</i>	Unclear sentences	Clarity
84.	specimens → samples, models	Word choice	Engagement
85.	irrigated → washed	Word choice	Engagement
86.	the same	Determiner use (a/an/the/this, etc.)	Correctness
87.	i.e.,	Comma misuse within clauses	Correctness
88.	, and	Punctuation in compound/complex sentences	Correctness

89.	, same	Punctuation in compound/complex sentences	Correctness
90.	i.e.,	Comma misuse within clauses	Correctness
91.	9 For Group 3, irrigation protocol was same as group 1 i.e. normal saline followed by sodium hypochlorite and for Group 4 same as group 2 i.e. normal saline followed by sodium hypochlorite and EDTA as a final irrigant for three minutes.	Unclear sentences	Clarity
92.	, and	Punctuation in compound/complex sentences	Correctness
93.	specimens → models, samples, examples, illustrations	Word choice	Engagement
94.	were → was	Faulty subject-verb agreement	Correctness
95.	, respectively	Punctuation in compound/complex sentences	Correctness
96.	9 After irrigation, all the specimens from the respective groups were dried using paper points and obturation of the specimens were done using zinc oxide eugenol and Endoflas according to four different groups respectively.	Unclear sentences	Clarity
97.	of	Wrong or missing prepositions	Correctness
98.	specimens → models, samples, examples, illustrations	Word choice	Engagement
99.	group → groups	Incorrect noun number	Correctness
100.	lentule → lentils	Misspelled words	Correctness
101.	respective → individual, separate	Word choice	Engagement

102.	10 → ten	Improper formatting	Correctness
103.	<i>the working length was ensured</i>	Passive voice misuse	Clarity
104.	, and	Punctuation in compound/complex sentences	Correctness
105.	a radiograph	Determiner use (a/an/the/this, etc.)	Correctness
106.	<i>Standardized obturation procedures for the respective materials were followed. 10 complete obturation of canal space in all the specimens till the working length was ensured and radiograph was taken for each tooth to ensure that obturating materials filled the apical third.</i>	Unclear sentences	Clarity
107.	<i>After completion of obturation in each specimen, the access cavity was sealed with the help of Tempfil, then wrapped in wet gauze to maintain a humid environment and stored in individual coded glasses at 37°C in an incubator to ensure setting of the obturation material.</i>	Hard-to-read text	Clarity
108.	<i>Root surfaces of all the specimens in the experimental groups (groups 1 to 4) were painted</i>	Passive voice misuse	Clarity
109.	2 → two	Improper formatting	Correctness
110.	air-dried → air-dried	Misspelled words	Correctness
111.	splitted → split	Misspelled words	Correctness
112.	a diamond	Determiner use (a/an/the/this, etc.)	Correctness
113.	a diamond	Determiner use (a/an/the/this, etc.)	Correctness

114.	<i>Each tooth was splitted longitudinally in a labiolingual direction using diamond disc and micromotor in a direction parallel to the long axis of the tooth with the help of diamond disc.</i>	Hard-to-read text	Clarity
115.	apical third → third apical	Misplaced words or phrases	Correctness
116.	the each	Determiner use (a/an/the/this, etc.)	Correctness
117.	splitted → split	Misspelled words	Correctness
118.	the stereomicroscopic	Determiner use (a/an/the/this, etc.)	Correctness
119.	as	Wordy sentences	Clarity
120.	the apex	Determiner use (a/an/the/this, etc.)	Correctness
121.	<i>Linear dye penetration from apex to the most coronal extent of dye penetration was measured</i>	Passive voice misuse	Clarity
122.	millimetres → millimeters	Mixed dialects of English	Correctness
123.	<i>Dye penetration for each specimen was evaluated by a single observer.</i>	Passive voice misuse	Clarity
124.	specimen → sample, example, model, instance	Word choice	Engagement
125.	<i>The score for each specimen was noted</i>	Passive voice misuse	Clarity
126.	, and	Punctuation in compound/complex sentences	Correctness
127.	was → were	Faulty subject-verb agreement	Correctness
128.	were → was	Faulty subject-verb agreement	Correctness

129.	, and	Punctuation in compound/complex sentences	Correctness
130.	<i>the mean value was calculated</i>	Passive voice misuse	Clarity
131.	the standard	Determiner use (a/an/the/this, etc.)	Correctness
132.	the standard	Determiner use (a/an/the/this, etc.)	Correctness
133.	, and	Punctuation in compound/complex sentences	Correctness
134.	the standard	Determiner use (a/an/the/this, etc.)	Correctness
135.	<i>microleakage values for all groups were compared</i>	Passive voice misuse	Clarity
136.	One way → One-way	Misspelled words	Correctness
137.	<i>Mean microleakage values for all groups were compared between all study groups by using One way Analysis of variance 'F' test (Table 5 and Graph 1) followed by intergroup comparison using Tukey's post hoc test (Table 6 and Graph 2).</i>	Unclear sentences	Clarity
138.	the One-way	Determiner use (a/an/the/this, etc.)	Correctness
139.	it → ; it, , and it, . It	Punctuation in compound/complex sentences	Correctness
140.	<i>it was found</i>	Passive voice misuse	Clarity
141.	a highly	Determiner use (a/an/the/this, etc.)	Correctness
142.	statistical → statistically	Misuse of modifiers	Correctness
143.	the four	Determiner use (a/an/the/this, etc.)	Correctness

		etc.)	
144.	The highest	Determiner use (a/an/the/this, etc.)	Correctness
145.	p-value → p-value	Misspelled words	Correctness
146.	group 1 was compared	Passive voice misuse	Clarity
147.	, but	Punctuation in compound/complex sentences	Correctness
148.	, and	Punctuation in compound/complex sentences	Correctness
149.	the difference was found	Passive voice misuse	Clarity
150.	, and	Punctuation in compound/complex sentences	Correctness
151.	group 2 was compared	Passive voice misuse	Clarity
152.	, and	Punctuation in compound/complex sentences	Correctness
153.	the group	Determiner use (a/an/the/this, etc.)	Correctness
154.	, and	Punctuation in compound/complex sentences	Correctness
155.	group 3 was compared	Passive voice misuse	Clarity
156.	the group	Determiner use (a/an/the/this, etc.)	Correctness
157.	, but	Punctuation in compound/complex sentences	Correctness
158.	the difference was not found	Passive voice misuse	Clarity
159.	key → critical	Word choice	Engagement

160.	<i>The three-dimensional obturation of the root canal system is widely accepted as a key factor for successful endodontic therapy.</i>	Hard-to-read text	Clarity
161.	<i>A three-dimensional well-fitted root canal prevents percolation and microleakage of periapical exudates into the root canal space, prevents reinfection, and creates a favorable biological environment for healing to take place.</i>	Hard-to-read text	Clarity
162.	a search, or the search	Determiner use (a/an/the/this, etc.)	Correctness
163.	, and	Comma misuse within clauses	Correctness
164.	apply also → also apply	Misplaced words or phrases	Correctness
165.	certain → specific	Word choice	Engagement
166.	This	Intricate text	Clarity
167.	cement → adhesive, glue	Word choice	Engagement
168.	<i>In permanent teeth, the cement is used to fill the gaps between the obturation material and the root canal walls.</i>	Unclear sentences	Clarity
169.	results → result	Faulty subject-verb agreement	Correctness
170.	gutta-percha → gutta-percha	Misspelled words	Correctness
171.	This	Intricate text	Clarity
172.	endoflas → end of las	Misspelled words	Correctness
173.	<i>This was the first study to evaluate microleakage between zinc oxide eugenol and endoflas as obturating materials in primary teeth.</i>	Hard-to-read text	Clarity

174.	<i>extracted primary anterior teeth were used</i>	Passive voice misuse	Clarity
175.	to	Wordy sentences	Clarity
176.	<i>To reduce variability</i>	Misplaced words or phrases	Correctness
177.	completing	Wordy sentences	Clarity
178.	<i>teeth were cut</i>	Passive voice misuse	Clarity
179.	fine → delicate	Word choice	Engagement
180.	negligible → minor, little	Word choice	Engagement
181.	<i>The results of the present study were evaluated</i>	Passive voice misuse	Clarity
182.	, and	Punctuation in compound/complex sentences	Correctness
183.	that,	Comma misuse within clauses	Correctness
184.	, Group → ; Group, . Group	Punctuation in compound/complex sentences	Correctness
185.	the least	Determiner use (a/an/the/this, etc.)	Correctness
186.	, but	Punctuation in compound/complex sentences	Correctness
187.	use of	Wordy sentences	Clarity
188.	a limited, or the limited	Determiner use (a/an/the/this, etc.)	Correctness
189.	the reduction	Determiner use (a/an/the/this, etc.)	Correctness
190.	a higher	Determiner use (a/an/the/this, etc.)	Correctness

191.	, which	Punctuation in compound/complex sentences	Correctness
192.	, which	Punctuation in compound/complex sentences	Correctness
193.	<i>Zinc oxide eugenol as an obturating material showed higher tendency for microleakage which might be because of the low flow of the zinc oxide eugenol which results in poor adaptation of the material to the dentinal wall.</i>	Hard-to-read text	Clarity
194.	<i>This</i>	Intricate text	Clarity
195.	F15,	Punctuation in compound/complex sentences	Correctness
196.	as compared to → than	Wordy sentences	Clarity
197.	finding → result, conclusion, discovery, determination	Word choice	Engagement
198.	the finding of	Wordy sentences	Clarity
199.	, who	Punctuation in compound/complex sentences	Correctness
200.	, which	Punctuation in compound/complex sentences	Correctness
201.	endoflas → end of las	Misspelled words	Correctness
202.	et al → et al.	Comma misuse within clauses	Correctness
203.	<i>Though no study has been conducted on comparison of zinc oxide eugenol and endoflas microleakage evaluation in primary teeth, Bawazir et al¹⁷ conducted a study to evaluate in vitro apical microleakage of root canal filling materials for primary teeth.</i>	Hard-to-read text	Clarity

204.	that,	Comma misuse within clauses	Correctness
205.	et al → et al.	Comma misuse within clauses	Correctness
206.	<i>Another study conducted by Ayer et al18 in which Endoflas FS showed lower apical microleakage as compared to zinc oxide eugenol.</i>	Unclear sentences	Clarity
207.	major → primary	Word choice	Engagement
208.	, but	Punctuation in compound/complex sentences	Correctness
209.	a significant	Determiner use (a/an/the/this, etc.)	Correctness
210.	a lower	Determiner use (a/an/the/this, etc.)	Correctness
211.	endoflas → end of las	Misspelled words	Correctness
212.	reason → reasons	Incorrect noun number	Correctness
213.	<i>19 Zinc oxide eugenol has lower flow rate than endoflas which might be one of the reason for higher microleakage in zinc oxide eugenol.</i>	Unclear sentences	Clarity
214.	, and	Punctuation in compound/complex sentences	Correctness
215.	the Group	Determiner use (a/an/the/this, etc.)	Correctness
216.	compare → compared	Incorrect verb forms	Correctness
217.	that,	Comma misuse within clauses	Correctness
218.	, when used along with NaOCl and EDTA,	Comma misuse within clauses	Correctness

219.	a lower	Determiner use (a/an/the/this, etc.)	Correctness
220.	the dentin	Determiner use (a/an/the/this, etc.)	Correctness
221.	, which	Punctuation in compound/complex sentences	Correctness
222.	the better	Determiner use (a/an/the/this, etc.)	Correctness
223.	<i>The reason for the lower microleakage in the Group 4 as compare to group 1 can be attributed to the fact that, Endoflas when used along with NaOCl and EDTA shows lower contact angle between dentin surface and the material which gives better sealing ability to the material.</i>	Unclear sentences	Clarity
224.	<i>This</i>	Intricate text	Clarity
225.	et al → et al.	Comma misuse within clauses	Correctness
226.	, which	Punctuation in compound/complex sentences	Correctness
227.	the wetting	Determiner use (a/an/the/this, etc.)	Correctness
228.	as compare → compared	Wordy sentences	Clarity
229.	compare → compared	Incorrect verb forms	Correctness
230.	the Group	Determiner use (a/an/the/this, etc.)	Correctness
231.	, which	Punctuation in compound/complex sentences	Correctness
232.	as a result of	Wordy sentences	Clarity
233.	, and	Punctuation in	Correctness

		compound/complex sentences	
234.	<i>In intergroup comparison, Group 2 (ZOE + NaOCl + EDTA) showed higher microleakage compared to Group 3 (Endoflas + NaOCl) and the difference was statistically significant ($p < 0.001$) The reason behind the higher microleakage in Group 2 as compared to Group 3 might be because of the property of the mat...</i>	Hard-to-read text	Clarity
235.	used → use	Incorrect verb forms	Correctness
236.	the smear	Determiner use (a/an/the/this, etc.)	Correctness
237.	, however → ; however, . However	Punctuation in compound/complex sentences	Correctness
238.	however,	Comma misuse within clauses	Correctness
239.	et al → et al.	Comma misuse within clauses	Correctness
240.	the combination, or a combination	Determiner use (a/an/the/this, etc.)	Correctness
241.	that,	Comma misuse within clauses	Correctness
242.	combination → cross, mixture, mix, blend	Word choice	Engagement
243.	combination → combinations	Incorrect noun number	Correctness
244.	in accordance with → by, following, per, under	Wordy sentences	Clarity
245.	As there → There	Wordy sentences	Clarity
246.	fibres → fibers	Mixed dialects of English	Correctness
247.	the primary	Determiner use (a/an/the/this, etc.)	Correctness

248.	less → more negligible	Word choice	Engagement
249.	the less, or a less	Determiner use (a/an/the/this, etc.)	Correctness
250.	the primary	Determiner use (a/an/the/this, etc.)	Correctness
251.	a limited	Determiner use (a/an/the/this, etc.)	Correctness
252.	effect → impact	Word choice	Engagement
253.	in → on	Wrong or missing prepositions	Correctness
254.	the reduction	Determiner use (a/an/the/this, etc.)	Correctness
255.	, and	Punctuation in compound/complex sentences	Correctness
256.	because of	Wordy sentences	Clarity
257.	, and	Comma misuse within clauses	Correctness
258.	in to → into	Misspelled words	Correctness
259.	endoflas → end of las	Misspelled words	Correctness
260.	less → fewer	Misuse of quantifiers	Correctness
261.	endoflas → end of las	Misspelled words	Correctness
262.	a tight	Determiner use (a/an/the/this, etc.)	Correctness
263.	seal → seals	Incorrect noun number	Correctness
264.	<i>Endoflas has shown lower microleakage as compare to zinc oxide eugenol because there is less voids formation in the endoflas</i>	Unclear sentences	Clarity

	<i>compare to zinc oxide eugenol, forming tight apical seal which restricted the penetration of tracing dye.</i>		
265.	endoflas → end of las	Misspelled words	Correctness
266.	in te → into	Misspelled words	Correctness
267.	, which	Punctuation in compound/complex sentences	Correctness
268.	<i>Also, the consistency of endoflas and mass formation after mixture leads to the flow of the material in to the dentinal tubule which creates good adaptation with the dentinal wall.</i>	Unclear sentences	Clarity
269.	The hydrophilic	Determiner use (a/an/the/this, etc.)	Correctness
270.	endoflas → end of las	Misspelled words	Correctness
271.	a significant	Determiner use (a/an/the/this, etc.)	Correctness
272.	, but	Punctuation in compound/complex sentences	Correctness
273.	eompare → compared	Incorrect verb forms	Correctness
274.	may be → maybe	Confused words	Correctness
275.	as eompare → compared	Wordy sentences	Clarity
276.	eompare → compared	Incorrect verb forms	Correctness
277.	the same	Determiner use (a/an/the/this, etc.)	Correctness
278.	, but	Punctuation in compound/complex sentences	Correctness
279.	a difference, or the difference	Determiner use (a/an/the/this, etc.)	Correctness

		etc.)	
280.	the irrigation	Determiner use (a/an/the/this, etc.)	Correctness
281.	in accordance with → by, following, per, under	Wordy sentences	Clarity
282.	et al → et al.	Comma misuse within clauses	Correctness
283.	, who	Punctuation in compound/complex sentences	Correctness
284.	the application of	Wordy sentences	Clarity
285.	care was taken	Passive voice misuse	Clarity
286.	, and	Comma misuse within clauses	Correctness
287.	constant washing action of saliva, sudden change in temperature and pH could not be duplicated	Passive voice misuse	Clarity
288.	the present	Determiner use (a/an/the/this, etc.)	Correctness
289.	Even though care was taken to replicate the conditions that exist in the oral cavity as far as possible, constant washing action of saliva, sudden change in temperature and pH could not be duplicated in present study.	Unclear sentences	Clarity
290.	evaluate the	Wordy sentences	Clarity
291.	the effect	Determiner use (a/an/the/this, etc.)	Correctness
292.	long term → long-term	Misspelled words	Correctness
293.	as compared to → than	Wordy sentences	Clarity
294.	Objective: The objective of this study	Objective: The objective of this	Originality

	<i>was to</i>	study was to understand ... http://erepository.uonbi.ac.ke/bitstream/handle/11295/83255/Mase_se_Changes%20in%20the%20contribution%20of%20genital%20tract%20infections%20to%20HIV%20acquisition.pdf?sequence=1&isAllowed=y	
295.	<i>A clean root canal system along with a three-dimensional seal is the clinician's path to success.</i>	Comparative evaluation of the efficacy of different herbal ... https://www.jisppd.com/text.asp?2020/38/4/374/306218	Originality
296.	<i>Elimination of microorganisms from infected root canals is a</i>	REVIEW ARTICLE An update on the antibiotic-based root ... https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.462.2807&rep=rep1&type=pdf	Originality
297.	<i>task. Numerous measures have been described to reduce the</i>	REVIEW ARTICLE An update on the antibiotic-based root ... https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.462.2807&rep=rep1&type=pdf	Originality
298.	<i>including the use of various instrumentation techniques, irrigation regimens and intra-canal medicaments.</i>	REVIEW ARTICLE An update on the antibiotic-based root ... https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.462.2807&rep=rep1&type=pdf	Originality
299.	<i>An optimal irrigant should have all or most of the positive characteristics</i>	Quantitative analysis of the effect of irrigation ... https://open.library.ubc.ca/media/download/pdf/24/1.0105156/2	Originality
300.	<i>but none of the negative or harmful properties. None of the available irrigating solutions can be regarded as optimal. Using a combination of products in the correct irrigation sequence contributes to a successful treatment outcome.</i>	International Journal of Current Microbiology and Applied ... https://www.ijcmas.com/vol-3-11/John%20Paul.pdf	Originality

301.	<i>The hermetic sealing of the root canal space is one of the objectives in root canal therapy.</i>	Sealing ability of hydroxyapatite as a root canal sealer ... https://core.ac.uk/download/pdf/206026317.pdf	Originality
302.	<i>to be irritating to the periapical tissues, does not resorb at the same pace as the roots and can cause necrosis of bone and cementum.</i>	Rajiv Gandhi University of Health Sciences http://rguhs.ac.in/cdc/onlinecdc/uploads/02_D034_37565.doc	Originality
303.	<i>Hence, this study was undertaken to evaluate and compare</i>	Full article: Structural and functional properties of ... https://www.tandfonline.com/doi/full/10.1080/10942912.2017.1295054	Originality
304.	<i>Methods: We carried out this in vitro experimental study at</i>	18th ISoP Annual Meeting "Pharmacovigilance without ..." https://link.springer.com/article/10.1007/s40264-018-0719-2	Originality
305.	<i>Access to the pulp chamber was obtained with no.</i>	Original Article Clinical and Radiographic Evaluation of ... https://adjc.journals.ekb.eg/article_139891_1ea46e24ee3fdd5f37e29486d55ee402.pdf	Originality
306.	<i>in individual coded glasses at 37°C in an incubator to ensure setting of</i>	Rajiv Gandhi University of Health Sciences http://rguhs.ac.in/cdc/onlinecdc/uploads/02_D034_37565.doc	Originality
307.	<i>in a direction parallel to the long axis of the tooth</i>	Rajiv Gandhi University of Health Sciences http://rguhs.ac.in/cdc/onlinecdc/uploads/02_D034_37565.doc	Originality
308.	<i>The presence of dye penetration at the interface of the obturation material and</i>	Rajiv Gandhi University of Health Sciences http://rguhs.ac.in/cdc/onlinecdc/uploads/02_D034_37565.doc	Originality
309.	<i>The three-dimensional obturation of the root canal system</i>	by Clifford J. Ruddle, DDS https://www.endoruddle.com/tc2pdfs/99/EndoAccess_Oct2007.pdf	Originality

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310.	<i>which had negligible alteration of the root content. This technique is less destructive than the cross-section, which provides knowledge about the adaptation of</i>	Comparative evaluation of the efficacy of different herbal ... https://www.jisppd.com/text.asp?2020/38/4/374/306218	Originality
311.	<i>in Group 2 as compared to Group 3</i>	"Oral administration of an anti-CfaE secretory IgA ... https://escholarship.umassmed.edu/faculty_pubs/1627/	Originality
312.	<i>It adheres firmly to the surface of the</i>	ITEM 709 REINFORCING STEEL - Columbus, Ohio https://www.columbus.gov/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=48135	Originality
313.	<i>The results are in accordance with the study</i>	Differential Diagnosis Of Hoarseness Of Voice In The Present Scenario: A Clinicopathological Study	Originality
314.	<i>Hence further studies are needed to be conducted</i>	The Types of Aloe Species and Their Multi-Functions in ... https://juniperpublishers.com/arr/pdf/ARR.MS.ID.555559.pdf	Originality

POST AND CORE

by MIDSAR Dental

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Writing Issues

364	205	159
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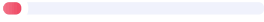




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51	Misspelled words	
23	Mixed dialects of english	
8	Faulty subject-verb agreement	
11	Comma misuse within clauses	
26	Improper formatting	
57	Determiner use (a/an/the/this, etc.)	
9	Unknown words	
34	Punctuation in compound/complex sentences	
3	Text inconsistencies	
10	Incorrect noun number	
1	Misuse of modifiers	
8	Confused words	
1	Misuse of semicolons, quotation marks, etc.	
1	Pronoun use	
2	Misplaced words or phrases	
1	Incorrect verb forms	
1	Incorrect phrasing	
5	Incomplete sentences	
42	Engagement	
42	Word choice	
65	Clarity	
25	Wordy sentences	

20	Passive voice misuse	
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POST AND CORE

POST AND CORE – REASON CHILD SMILES TODAY

Introduction –

Aesthetics is a branch of philosophy related ¹with beauty and the beautiful (Merriam Webster ²dictionary). So ³paediatric aesthetic dentistry is a branch that 365 deals with the maintenance and augmentation of the beauty of the mouth of infants and children through adolescence, including those with special health care needs.1

Severe early childhood caries ⁴is ⁵a destructive condition for both the child 366 enduring dental treatment and the concerned parents. It is also challenging for pediatric dentists to reinstate severely broken down teeth.2 The goal of dental 367 treatment is to restore the lost tooth structure ⁶so as to maintain function and prevent changes in mastication, phonetics, development of parafunctional 368 habits ⁷and psychological problems that will affect a child's self-confidence.

Clinicians have made several attempts to restore such grossly carious primary anterior teeth with different and advanced root canal retentive post and core systems so that ⁸the primary teeth can be retained until their replacement by successors.3

Dental caries ⁹is an etiological factor responsible for the devastation of many primary teeth. The early loss of maxillary primary anterior teeth can be related to esthetic concerns and functional problems, such as space loss, masticatory deficiency, phonetic changes, lack of pre-maxillary development and resulting malocclusion, development of para-functional habits ¹⁰and ¹¹psychological 369 ¹²problems that interfere in the personality and the behavior of the child. ¹³Teeth damaged due to caries or trauma undergo endodontic treatment followed by

restoration of crown to attempt optimal functional and esthetic restoration in order to maintain integrity of dental arches in oral cavity. Endodontically treated teeth usually undergo numerous changes due to loss of blood supply, dehydration, alteration of the physical and mechanical properties letting alone the loss of significant dental tissues.^{4,5} The clinical decision for restoring an endodontically treated tooth by provision of an intracoronal or extracoronal restorative modality is empirical. It is usually scientific evidence based along with clinicians judgement to undergo various procedures accounting remaining tooth, bone support, ferrule existence, associated pathology and occlusal as well as other biomechanical forces.²⁸ When such tooth is left with limited supraosseous tissues, a post might be considered for its restoration to provide a platform for retention, either for an intracoronal or extracoronal restoration.^{6,7} Various in vitro and in vivo research has demonstrated improved root fracture resistance and improved crown retention with different post systems.⁸⁻¹¹ On the contrary, stresses induced in radicular dentin due to post placement, particularly in debonded posts, is one of the main factor in crack initiation and propagation leading to root fracture.

POST -

370 The primary aim of a post is to retain the coronal restoration in an endodontically treated tooth that has suffered an extensive loss of crown structure. Several techniques and materials are proposed for the restoration of endodontically treated teeth. Metallic prefabricated and cast posts have been used for decades. More recently, in response to the request for tooth-coloured posts, several non-metallic dowels have been marketed. Among them, epoxy resin posts reinforced with carbon fibres, epoxy or methacrylate resin posts

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reinforced with quartz or glass fibres, zirconia posts, and polyethylene fibre-reinforced posts can be distinguished.

In primary anterior teeth numerous types of posts are used such as customized and prefabricated. The examples of customized post are metallic (gamma, omega) and non metallic(composite, mushroom ,biologic). The examples of prefabricated post are metallic (reverse metal) and non metallic (fibre, polythelene, glassfibre). All these post have shown varying success rates over a period of 6 months to three years.¹²

Core –

The aim of the post is to retain the core, which successively helps to retain the crown. With cast post and cores, the core is formed on the post directly on the tooth or indirectly on a cast. The general shape and alignment of the core is developed during fabrication. Prefabricated posts are used in combination with a restorative build-up material which is formed after cementation of the post.

The choices are amalgam, composite resin, or glass-ionomer materials.¹³

The glass-ionomer materials, including resin-modified glass ionomer, lack adequate strength as a buildup material and should not be used in teeth with extensive loss of tooth structure. Amalgam was used as a buildup material,

with well recognized strengths and limitations. It has good physical and mechanical properties and works well in high-stress areas. In many cases, it requires the addition of pins or other methods to provide retention and resistance to rotation. Placement can be clumsy when there is minimal coronal tooth structure, and the crown preparation must be delayed to permit the material time to set.¹⁴ Amalgam can cause esthetic problems with ceramic crowns and sometimes makes the gingiva look dark. There also is a risk of tattooing the cervical gingiva with amalgam particles during the crown preparation. For these reasons, and potential concern about mercury, it is no

longer widely used as a buildup material. Amalgam has no natural adhesive properties and should be used with an adhesive system for buildup. Currently, composite resin is the most popular core material and has some characteristics of an ideal buildup material. It can be bonded to many of the current posts and to the remaining tooth structure to increase retention. It has high tensile strength and the tooth can be prepared for a crown immediately after polymerization.15 Pilo et al. showed that composite cores have fracture resistance analogous to amalgam and cast post and cores, with more favorable fracture patterns when they fail. It is tooth colored and can be used under translucent restorations without affecting the esthetic result. On the negative side, composite shrinks during polymerization, causing gap formation in the areas in which adhesion is weakest. It absorbs water after polymerization, causing it to swell, and undergoes plastic deformation under repeated loads. Adhesion to dentin on the pulpal floor is generally not as strong or reliable as to coronal dentin. Strict isolation is an absolute requirement. If the dentin surface is contaminated with blood or saliva during bonding procedures, the adhesion is greatly reduced. Although composite resin is far from ideal, it is currently the most widely used buildup material. Composite is not a good choice, however, with minimal remaining coronal tooth structure, particularly if isolation is a problem.16

HISTORY

In 1728, Pierre Fauchard described the use of "TENONS" which were metal posts screwed into the roots of teeth to retain the prosthesis.

1745 – Claude Mouton published his design of a gold crown with a gold post that was to be inserted into the root.

1830-1870 – Wood replaced metal as the material of choice for posts.

1839 Harris proposed that gold and platinum were superior to brass, silver and copper which tended to corrode .

G.V. Black 1869 developed porcelain fused to metal crown held in by a screw inserted into a canal filled with gold foil

"Pivot crown" – a wooden post fitted to an artificial crown and to root canal.

In 1966 prefabricated posts and composite resin cores came into use.

In 1990 Duret et al. described a non-metallic material for the fabrication of posts based on the carbon-fibre reinforcement principle.

Ideal Properties of Post -17

An ideal post and core should be resorbable but it should provide adequate retention and resistance.

Post should be well adapted to the inner dentinal wall as it is one of the factors governing factors for the retention of the restoration.

The post should extend coronal from the root to anchor the core and subsequently the crown.

It should provide pleasing esthetics where indicated.

The post should be radiographically visible and it should be bio compatible.

Provide maximal retentiveness to the core.

Physical properties compatible to core

Maximum retention with minimum removal of dentin

Even distribution of functional stresses along root surfaces

Esthetic compatibility

Minimal stress during placement and cementation

Resistance to displacement.

Easy retrievability

Ease of use

Reasonable cost

CLASSIFICATION OF POST USED IN PRIMARY TEETH: 18

Post which are⁹⁸ used in primary teeth can be classified based on on-⁹⁹

1. Based on types of post space design
2. Based on material used
3. Based on post design
4. Based on fabrication
5. Based on retention²⁹

Based on post space design

Mushroom shaped¹⁰⁰

Tapered shaped

Onion shaped

Based on material used

Custom Made

Metallic

Alpha

Gamma

Omega & Half Omega

Cast Post¹⁰¹

Nonmetallic

Composite

Mushroom

Biologic

Prefabricated

Metallic

Prefabricated Metal Post

Reverse Metal Post

Nonmetallic

Fibre Post

Everstick¹⁰² Post

PolytheleneFibre Post

Glass Fibre Post

Based on post design-

Threaded

Non-threaded

Alpha

Half omega shaped¹⁰³

Omega shaped

Modified anchor shaped¹⁰⁴

Gamma shaped

Based on fabrication¹⁰⁵ method

Direct method

Metallic post

Fiber posts

Indirect method

Resin composite post

b) Cast metal post

Based on retention²⁹

Active post

Passive post

INDICATION OF USING POST IN PRIMARY TEETH^{19,20}

2/3rd of tooth structure left- not indicated

½ crown structure lost- indicated

At least 1 mm of tooth structure supragingivally¹⁰⁶

Reduced crown tooth structure.

The main reason for using a post is to reestablish the shape and form of a severely decayed or fractured maxillary anterior tooth crown while¹⁰⁷ it provides support for the final restoration.

The posts also increase the resistance of the restored teeth to mechanical load.

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CONTRAINDICATIONS

Severe curvature of the root-eg: Dilacerations of the root.

Persistent periapical lesion

Poor periodontal health

Poor crown to root ratio

Weak / fragile¹⁰⁸ roots

Teeth with heavy occlusal contacts

Patients with unusual and occupational habits

Economic factors

Inadequate skill.

VARIOUS POSTS WHICH CAN BE USED IN PRIMARY TEETH ¹⁰⁹

METAL POST

Custom made

uOmega ¹¹⁰ post and its modifications

uAlpha ¹¹¹ post

uGamma ¹¹² post

uModified ¹¹³ anchor shaped ¹¹⁴ post

Prefabricated post

uMetal ¹¹⁵ post

uReverse ¹¹⁶ metal post

Metal posts are made up of stainless steel wire of 22 gauge/0.7 mm.

They are rigid but not esthetic.

Retention can be increased ¹¹⁷ with addition ¹¹⁸ of serration in the post. They ¹¹⁹ may interfere with

physiologic root resorption if they are placed beyond 3 mm in the canal.

Post length: 3 mm – radicular; 2 to 3 mm - coronal

Omega post

The use of Omega loop ¹²⁰ was introduced by Mortada and Kingas intra canal ¹²¹ retainer in the year 2004.

Total ¹²² of 5 mm long post is used in primary teeth. Both 3mm long free ends of post ^{123,124} is placed ¹²⁵ inside

the ¹²⁶ canal. Remaining ¹²⁷ 2 mm of omega post provides retention ²⁹ to the coronal restoration.

Advantages: 21

¹²⁸
Quick process

¹²⁹
Wire does not cause any internal stresses in the root canal as it is incorporated in the restorative material ¹³⁰ mainly and ¹³¹ it can be done ¹³² with minimal ¹³³ chair side ¹³⁴ time.

¹³⁵
Coronal extension provides retention ²⁹ to coronal restoration

Disadvantages:

¹³⁶
The adhesion between Omega wire and dentinal ¹³⁷ wall is mechanical.

³⁷⁹
The wire adaptation to the internal walls is inadequate, leading to dislodgement of the wire and radicular fracture due to excessive masticatory forces. ¹³⁸

¹³⁹
Hence retention of Omega ¹⁴⁰ loop is less compared to GFRC(Glass Fibre Reinforced Composite).

HALF OMEGA POST

³⁸⁰
 Stainless steel wire is bent to half omega ¹⁴¹ shaped to make the post. Serrations are added to increase the potential surface area for attachment of the restorative material and consequently increase the long-term stability of an esthetic restoration.

ALPHA POST

Stainless steel wire is bent into Alpha shaped and placed in the canal and ¹⁴² here also the extension ¹⁴³ of the post in the canal ¹⁴⁴ should not be more than 3 ¹⁴⁵ mm.²²

GAMMA POST

0.6-mm orthodontic wire is bent to form the Greek letter "y". ¹⁴⁶ The loop portion is placed inside the post space, and the 2 ¹⁴⁷ free ends are placed toward the coronal portion ¹⁴⁸ and help to provide retention ²⁹ to coronal restoration.²³

MODIFIED ANCHOR SHAPED POST²⁴

381 It was introduced to overcome the retentive problems of omega posts.¹⁴⁹
 383 gauge orthodontic wire, 1.5 inch¹⁵⁰ in length, is bent using a universal plier. For
 384 post fabrication^{151,152} one of the arms of wire¹⁵³ is bent downwards¹⁵⁴ and turned it to the
 opposite side.Repeat¹⁵⁶ the same procedure for the other arm.Bend¹⁵⁷ the free end
 of the arms¹⁵⁹ towards the curved end.Cut¹⁶⁰ the excess wire as required.By¹⁶¹
 compressing the curved end¹⁶², the free end opens up to adapt to the walls of the
 root thereby¹⁶³ giving extra mechanical retention²⁹. Excess compression is not
 advised as it may cause root fracture. The post is placed in the prepared root
 canal and checked for adaptation. Mushroom shaped¹⁶⁴ retention grooves are
 placed on the inner side of the root to
 create locking mechanism thereby¹⁶⁵ increasing retention²⁹.

Advantages over Omega post-

- 385 · The free end has two arms crisscrossing to the opposite side which adapt to the walls of the root- extra retention²⁹
- 386 · The curved end provides strength to the coronal structure.
- Adaptation can be enhanced by compressing at the curved end¹⁶⁶ which opens up the arms at the free end¹⁶⁸¹⁶⁷.
- Hence it is a simpler¹⁶⁹, easier¹⁷⁰, and inexpensive technique for treating severely damaged teeth.

NICKEL CHROMIUM POST WITH MACRORETENTIVE ELEMENT²⁵

Rodrigues Filho and co-workers (1995)¹⁷¹ described the use of nickel-chromium (Ni-Cr) cast posts with macroretentive¹⁷¹ elements. Such posts varied from 1.5 to 3.0 mm in diameter. For cementation of this post dual-cured¹⁷² adhesive or resin

387 composite is used. The objective of this technique is to increase the resistance
of the restored teeth to mechanical loading by bonding the intra canal retainer.¹⁷³
The round macroretentive¹⁷⁵ elements in Ni-Cr cast posts offer a better
distribution of masticatory loading forces.¹⁷⁶ The possibility of
388 chemical/mechanical adhesion by using adhesive systems allows for the
integration¹⁷⁷ of restorations to the dental structure. These posts are indicated for
the reinforcement¹⁷⁸ of enlarged canals, considering that limited amounts of
dentin tissue are available, which is a common situation during restoration¹⁷⁹
of primary anterior teeth. They are prefabricated in several diameters, and
therefore can be readily used.

CAST METAL POSTS^{26,27}

They are fabricated by using indirect¹⁸⁰ method of fabrication. They have¹⁸¹
disadvantages like they are expensive and require an additional laboratory
stage for preparation of post¹⁸² and they could pose problems during the natural
tooth exfoliation.¹⁸³

REVERSE METAL POST²⁸

Short¹⁸⁴ prefabricated metal post is used as reverse¹⁸⁵ metal post. The post is
inserted upside down so that the 3-mm head into the canal and the remaining 5
mm of the threaded section was positioned out of the canal as a core for
coronal restoration.¹⁸⁶ Bevelling should be done to reduce the stress
concentrated at the dentinal walls¹⁸⁷ and then the head of the post was try-fitted¹⁸⁸
with the coronal 3 mm of the canal.¹⁸⁹

Canal preparation:

3 mm of the coronal part of the canal was prepared for future replacement of
post. Canal¹⁹⁰ is prepared almost rectangular with semi-rounded line angles in

¹⁹¹
order to match with the quadrangle core of a prefabricated metal post that is
planned to be placed reversely into the prepared canal. ¹⁹² ¹⁹³ Core length of
 prefabricated metal posts is 3mm.

Advantages

¹⁹⁴ Easy-to-perform and economical procedure with adequate retention and good
 esthetic.

Disadvantages

¹⁹⁶ The possibility of cracked root ¹⁹⁷ subsequent to long-term function, especially in
 children with heavy occlusion or parafunctional habits.

Glass Ionomer short post²⁹

Carranza F, Garcia GF in 1999 has used glass ionomer cement directly as post ¹⁹⁸
 in primary anterior teeth to increase the retention ²⁹ of coronal ¹⁹⁹ restoration.

COMPOSITE POSTS

Composite short post^{30,31}

They are fabricated directly in post space by using composite material. It
 provides satisfactory esthetics but ²⁰⁰ retention ²⁹ due to polymerization contraction
 & shrinkage could be a risk.

²⁰¹
Inverted mushroom shaped design post³⁰

No. 6 round bur was used to create a 360° "inverted mushroom undercut" in the
 apical 2 mm to the gingival margin of the tooth. To prepare the undercut, ²⁰² the
 bur aligns parallel to the long axis of the root and ²⁰³ the maximum lateral
 extension of the bur was limited by the shank of the bur as it contacted the
 dentinal wall. ²⁰⁴ The prepared canal and coronal structure were then cleaned,
rinsed ²⁰⁵ and air-dried. A light-cured bonding agent is applied ²⁰⁶ Light-cured

composite resin in 2, 1.5 mm increments to fabricate the composite short post.²⁰⁷
 The crown is reconstructed with the same composite resin using appropriate celluloid crowns.

Indirect composite post³²

Composite post can also be made in the laboratory to be used as post.²⁰⁸ For fabrication of indirect composite post,²⁰⁹ No 4²¹⁰ carbide burr with a lowspeed²¹¹ rotary instrument is used to remove 1/3rd root fillings. Impression of the canal is then made by using low-viscosity elastomeric impression material with preformed wooden sticks. According to the diameter of canals²¹² post selection²¹³ should be done.²¹⁴ Thin coat of die isolation varnish should be applied²¹⁶ on the canal walls to prevent adhesion of composite to canal walls. A silane primer layer was applied²¹⁶ to the post to improve its adhesion to the composite resin. After that composite build up²²⁰ with embedded post followed by coronal composite build up²²¹ should be done.²²³ After its fabrication trial should be done in patient.²²⁴ The post^{225,226} is cemented in the canal after etching, drying rinsing,²²⁸ adhesive resin application and adhesive resin cement is used for post cementation.²²⁹

Fibre based post²³⁰²³¹³³⁻³⁵

Fibre based posts²³² are available in various diameter & length.²³³²³⁴²³⁵

Types:

Polyethylene fibre post²³⁶

Glass fibre post²³⁷

Glass fibre reinforced composite resin Post (GFRP)²³⁸

Carbon fibre post²³⁹

Advantages

389 | High tensile strength,

Increased fatigue resistance and inherent rigidity,
 Increased resistance to corrosion, biocompatibility to different core materials,
 Good chemical bonding to Bis-GMA resins,
 A young modulus of elasticity approaching that of dentin

Advantages of fibres²⁴⁰ post over metal post ·

Esthetics

Translucency

Resin composite crown reinforcement

Ease for manipulation

Polyethelene Fibre posts³⁶

These posts are preferred as they improve the impact strength, modulus of elasticity, & flexural strength. They are almost invisible in resin²⁴¹ matrix, in contrast to glass fibers, which fail to stick to resin²⁴² matrix. For the step wise²⁴³ preparation of this post system first removal of 2 mm of the coronal portion of the root filling should be done.²⁴⁴ Coronal²⁴⁵ structures and pulp chamber were etched and conditioned²⁴⁶ properly. Polyethylene fibers conditioned²⁴⁷ with bonding²⁴⁸ agent, placed in the slot of the root canal, are stabilized with composite material. Polyethylene fibers, 2 –3 mm in length²⁴⁹ are maintained above the crown to reinforce the coronal structure.

Ribbon fibres³⁷

These fibres²⁵⁰ have adequate translucency²⁵¹ for cases with great²⁵² esthetic²⁵³ appeal because they can be camouflaged inside the resin composite structure, as in cases of intra canal²⁵⁴ reinforcement.They²⁵⁵ have

advantages of easy to manipulate, fall apart, or rebound, maintaining unaltered extension after being cut. ²⁵⁶ Dual cure resin cement is used with ribbon fibres ²⁵⁷ and ²⁵⁸ final ²⁵⁹ restoration is done with composite resin.

²⁶⁰ Glass fibre post 38,39

They are composed of unidirectional glass fibres ²⁶¹ embedded in resin ²⁶² matrix. They have advantage ²⁶³ of Stress distribution ²⁶⁴ over broad ²⁶⁵ surface area and they are increasing the load threshold. Disadvantage ^{266,267} of this ²⁶⁸ post system are ²⁶⁹ failure to stick to the resinous matrix which ²⁷⁰ interferes with the esthetics and interfere ²⁷¹ with resorption if extended beyond 3 mm.

²⁷² Glass fibre reinforced composite resin posts 39

They are new ²⁷³ generation of fiber posts composed of densely packed silanated glass fibers in light ²⁷⁴ cure ²⁷⁵ gel matrix. The fibers are of ²⁷⁶ 7 to 10 µm in diameter. Its flexural strength is 1280 MPa which is closer to dentin so ²⁷⁷ decrease ^{278,279} root fracture. They have greater ease of handling and can be used in high ²⁸⁰ stress bearing ²⁸¹ areas. They are invisible in resin ²⁸² matrix so ²⁸³ are the most suitable for esthetic needs. The GFRC post cured for 20 seconds in ²⁸⁴ order ²⁸⁵ to gain rigidity, before insertion into the post space. Light cured flowable composite resin is used into the canal chamber after ²⁸⁶ which ²⁸⁷ the GFRC post is inserted. The ²⁸⁸ fiber post & composite are then cured together. The coronal portion of the glass fibre reinforced composite post ²⁹⁰ is splayed to increase the surface area for the ²⁹¹ retention ²⁹² of the core. Eg ²⁹³ .Everstick ^{294,295} post.

Carbon fibre post²⁹⁶

392 It is non-metallic prefabricated post systems²⁹⁷. Carbon fiber based posts²⁹⁸ are essentially composite materials. They are made of equally stretched and continuous aligned unidirectional carbon fibers,
393 8mm in diameter, embedded in an epoxy resin matrix. The carbon fiber post is a passive²⁹⁹ post, which is black in colour^{300,301}. They are available in different sizes (from 1 to 1.7mm) and shapes (parallel sided³⁰², tapered, smooth and³⁰³ serrated forms).

Ceramic post³⁹

394 It is made of zirconium oxide ceramic. Yttrium oxide was added as a stabilizing agent. Ceramic post has a cylindro-conical³⁰⁴ design, where the post³⁰⁵ tapers in its apical third in order to preserve tooth^{306,307} structure and to facilitate cementation.

Advantages:

Biocompatibility, resistance to corrosion and inability to stain the tooth structure, outstanding
395 esthetics, resulting from the optical properties of the post material,
396 The post can be used directly using composite core or indirectly using the heat pressed technique to achieve a ceramic core build up³⁰⁸.

397 Successful³⁰⁹ alternative to restore function and esthetics in children with badly decayed primary anterior teeth.

Biologic post

398 The term biological restoration was introduced by Santos and Bianchi (1991) to
describe an alternative technique that uses adhesive capabilities of materials
in combination ³¹⁰ with strategic placement of parts of extracted human teeth.⁴¹
399 Ramires-Romito et al (2000), ³¹¹ used teeth from the Human Tooth Bank of Sao
Paulo University Dental School to be used as natural posts and crowns to fit
into the roots and replace the crowns as well.⁴²

400 Tooth bank procedure
The collected samples of extracted teeth were thoroughly scaled, polished, and
freed of soft
tissues and periodontal remnants.
401 The pulps were removed ³¹² from root canals and ³¹³ complete biological preparation
was done. ³¹⁴
402 After preparation, all the sample teeth were placed in the ultrasonic tank
operating at 42
GHz and 100 W output, at five working cycles in 6% H2O2. ³¹⁵
Each tooth was sonicated for 30 minutes.
Teeth were stored at 4 degree ³¹⁶ C in Hank's balanced salt solution (HBSS) with
donor
identification till the time it was used. ³¹⁷

Preparation of biological restoration

Teeth selected from the tooth bank are reshaped to be used as natural post and
crown using
crown preparation kit (Shofu).

The roots that are shaped to function as posts are strengthened by flowable
composite material.

403 | Tooth selected and prepared for use as biological restoration is then autoclaved for 30 minutes at 121 ³¹⁸ degree C and 15lbs pressure before cementation. The tooth is then tried for fit and adjustments to be done.

Advantages

Natural tooth obtained from patient ³¹⁹ or from ³²⁰ tooth bank

Easy to perform

Economical

Disadvantages

Not acceptable by many patients

Need of tooth bank

Donor & recipient acceptance & cross infection make this treatment option largely impractical.

Difficulties of post ³²¹ in primary teeth:

- Difficulty in extension ³²² of post length due to short ³²³ length of primary roots & primary tooth roots can resorb over a period of time. ³²⁴
- Due to short post length, Retention ²⁹ is compromised
- Chances of loss of crown due to trauma.

404 | · The morphology and histology of primary teeth present a less surface area for bonding, relatively large pulp chamber and ³²⁵ aprismatic enamel ³²⁶ which is difficult to etch.

405 | · The destruction of the tooth structure frequently involves the entire crown leaving just the root dentine for bonding of the restorative material and thus increasing the failure rate. ³²⁷

Canal Preparation For Post And Core In Primary Teeth

About 4 mm of root canal filling material is removed from the canal. 1 mm of cement is placed³²⁸ over³²⁸ the filling material of the canal³²⁹. The rest 3 mm canal space is used for the placement of post³³⁰.

For that Glass³³¹ Ionomer Cement can be used as a 1 mm GIC button over the filling material. (Kumar R, 2014) Other than GIC, Zinc Polycarboxylate cement can also be used.

Extension Of Post In The Primary Root Canal

Innovations for short retentive posts are needed in primary dentition³³² due to the physiological resorption³³³ that occurs in primary dentition, unlike the post³³³ and core used in adult³³⁴ dentition.

Intra-canal placement is around 3mm that is the cervical one-third of the canal so³³⁵ it does not interfere with deciduous tooth root resorption and permanent tooth eruption.

Luting Agents

Many luting agents can be used for the cementation of post³³⁶ in primary³³⁷ canal. The selection³³⁸ of luting agents mainly depends on the type and material of the post being used.

Coronal restorations after post³³⁹ placement:

Remaining³⁴⁰ coronal structure can be restored with direct or indirect technique³⁴¹ or with single tooth prostheses like³⁴²-

- Strip crowns
- Stainless steel crowns
- Porcelain veneers
- Polycarbonate crowns
- Acrylic resin crowns

CONCLUSION

406

Following conclusions can be made from this review article-

- For placing post³⁴³ in primary teeth³⁴⁴ 3 mm radicular extension and 2-3 mm coronal extension of post should be used^{345 346 347 348} to prevent interference in shedding procedure.
- Omega post and its modifications are the most frequently used post in the primary teeth.
- When composite³⁴⁹ post is used³⁵⁰ the inverted mushroom shaped³⁵¹ canal preparation is most suitable for the retention of composite^{29 352 353} post.
- Fibre posts can also be used³⁵⁴ effectively in primary teeth. Amongst various available fibre³⁵⁵ posts, polyethelenefibre³⁵⁶ post has proved to be better.
- Biologic post can also be successfully used³⁵⁷ in the primary teeth if tooth bank³⁵⁸ facility is available.
- Selection of luting agent³³⁸ completely depends on type³⁵⁹ of post.³⁶⁰
- Coronal restoration should be done by using direct or indirect restorative³⁶¹ techniques. Full³⁶³ coronal restoration is must³⁶⁴ after placement of post.³⁶²

1.	with → to	Wrong or missing prepositions	Correctness
2.	Merriam-Webster → Merriam-Webster	Misspelled words	Correctness
3.	paediatric → pediatric	Mixed dialects of English	Correctness
4.	is → are	Faulty subject-verb agreement	Correctness
5.	a destructive → a dangerous, a bad	Word choice	Engagement
6.	so as to → to	Wordy sentences	Clarity
7.	, and	Comma misuse within clauses	Correctness
8.	<i>the primary teeth can be retained</i>	Passive voice misuse	Clarity
9.	is → are	Faulty subject-verb agreement	Correctness
10.	, and	Comma misuse within clauses	Correctness
11.	and psychological	Improper formatting	Correctness
12.	problems → issues	Word choice	Engagement
13.	<i>The early loss of maxillary primary anterior teeth can be related to esthetic concerns and functional problems, such as space loss, masticatory deficiency, phonetic changes, lack of pre-maxillary development and resulting malocclusion, development of para-functional habits and psychological proble...</i>	Hard-to-read text	Clarity
14.	restoration → repair	Word choice	Engagement
15.	in order to → to	Wordy sentences	Clarity
16.	the integrity	Determiner use (a/an/the/this, etc.)	Correctness

17.	the oral	Determiner use (a/an/the/this, etc.)	Correctness
18.	<i>Endodontically treated teeth usually undergo numerous changes due to loss of blood supply, dehydration, alteration of the physical and mechanical properties letting alone the loss of significant dental tissues.</i>	Unclear sentences	Clarity
19.	endodontically	Unknown words	Correctness
20.	the provision	Determiner use (a/an/the/this, etc.)	Correctness
21.	provision of an → providing	Wordy sentences	Clarity
22.	intracoronal	Unknown words	Correctness
23.	extracoronal → extra coronal	Misspelled words	Correctness
24.	restorative → therapeutic, healing	Word choice	Engagement
25.	evidence based → evidence-based	Misspelled words	Correctness
26.	judgement → judgment	Mixed dialects of English	Correctness
27.	, as	Punctuation in compound/complex sentences	Correctness
28.	<i>It is usually scientific evidence based along with clinicians judgement to undergo various procedures accounting remaining tooth, bone support, ferrule existence, associated pathology and occlusal as well as other biomechanical forces.</i>	Unclear sentences	Clarity
29.	retention; Retention	Text inconsistencies	Correctness
30.	intracoronal	Unknown words	Correctness
31.	extracoronal → extra coronal	Misspelled words	Correctness

32.	restoration → repair	Word choice	Engagement
33.	post-placement → post-placement	Misspelled words	Correctness
34.	of the → of the	Improper formatting	Correctness
35.	factor → factors	Incorrect noun number	Correctness
36.	of a post	Wordy sentences	Clarity
37.	<i>endodontically</i>	Unknown words	Correctness
38.	<i>endodontically</i>	Unknown words	Correctness
39.	tooth-coloured → tooth-colored	Mixed dialects of English	Correctness
40.	fibres → fibers	Mixed dialects of English	Correctness
41.	fibres → fibers	Mixed dialects of English	Correctness
42.	fiber-reinforced	Mixed dialects of English	Correctness
43.	<i>polyethylene fibre-reinforced posts can be distinguished</i>	Passive voice misuse	Clarity
44.	teeth,	Comma misuse within clauses	Correctness
45.	, such	Punctuation in compound/complex sentences	Correctness
46.	post → posts	Incorrect noun number	Correctness
47.	non-metallic → nonmetallic , non-metallic	Misspelled words	Correctness
48.	mushroom ,	Improper formatting	Correctness
49.	, biologic	Improper formatting	Correctness
50.	post → posts	Incorrect noun number	Correctness
51.	post → center	Word choice	Engagement

52.	non-metallic → nonmetallic, non-metallic	Misspelled words	Correctness
53.	fibre → fiber	Mixed dialects of English	Correctness
54.	polythelene → polyethylene, polyphenylene	Misspelled words	Correctness
55.	glassfibre → glass fibre	Misspelled words	Correctness
56.	post → posts	Determiner use (a/an/the/this, etc.)	Correctness
57.	over a period of → over, for	Wordy sentences	Clarity
58.	The post aims	Wordy sentences	Clarity
59.	retain → maintain	Word choice	Engagement
60.	eeees → roots, bodies, spirits, centers	Word choice	Engagement
61.	eeere → body, heart, center, soul	Word choice	Engagement
62.	on the post	Wordy sentences	Clarity
63.	post → bar, base	Word choice	Engagement
64.	eeere → body, heart, soul, center	Word choice	Engagement
65.	is → are	Faulty subject-verb agreement	Correctness
66.	<i>build-up; buildup</i>	Text inconsistencies	Correctness
67.	<i>Prefabricated posts are used in combination with a restorative build-up material which is formed after cementation of the post.</i>	Unclear sentences	Clarity
68.	well recognized → well-recognized	Misspelled words	Correctness
69.	<i>the crown preparation must be</i>	Passive voice misuse	Clarity

	<i>delayed</i>		
70.	reasons,	Comma misuse within clauses	Correctness
71.	Currently, composite → Composite	Wordy sentences	Clarity
72.	the composite	Determiner use (a/an/the/this, etc.)	Correctness
73.	<i>It can be bonded to many of the current posts and to the remaining tooth structure to increase retention.</i>	Unclear sentences	Clarity
74.	, and	Punctuation in compound/complex sentences	Correctness
75.	<i>the tooth can be prepared</i>	Passive voice misuse	Clarity
76.	erere → bodies, roots, seats, hearts	Word choice	Engagement
77.	tooth colored → tooth-colored	Misspelled words	Correctness
78.	Adhesion → Bonding	Word choice	Engagement
79.	greatly → significantly	Word choice	Engagement
80.	particularly → mainly	Word choice	Engagement
81.	TENONS,	Punctuation in compound/complex sentences	Correctness
82.	, and	Comma misuse within clauses	Correctness
83.	, which	Punctuation in compound/complex sentences	Correctness
84.	corrode → rust, erode	Word choice	Clarity
85.	<i>1839 Harris proposed that gold and platinum were superior to brass, silver and copper which tended to corrode.</i>	Unclear sentences	Clarity

86.	te	Wordy sentences	Clarity
87.	a root, or the root	Determiner use (a/an/the/this, etc.)	Correctness
88.	, Duret	Punctuation in compound/complex sentences	Correctness
89.	carbon-fibre → carbon-fiber	Mixed dialects of English	Correctness
90.	An ideal → An excellent	Word choice	Engagement
91.	, but	Punctuation in compound/complex sentences	Correctness
92.	The post	Determiner use (a/an/the/this, etc.)	Correctness
93.	the retention of → retaining	Wordy sentences	Clarity
94.	eoronal → coronally	Misuse of modifiers	Correctness
95.	, and	Punctuation in compound/complex sentences	Correctness
96.	bio-compatible → biocompatible	Confused words	Correctness
97.	te → with	Wrong or missing prepositions	Correctness
98.	are → is	Faulty subject-verb agreement	Correctness
99.	on	Inappropriate colloquialisms	Delivery
100.	Mushroom-shaped → Mushroom-shaped	Misspelled words	Correctness
101.	Cast → Last	Confused words	Correctness
102.	Everstick → Overstock	Misspelled words	Correctness
103.	omega-shaped → omega-shaped	Misspelled words	Correctness

104.	anchor shaped → anchor-shaped	Misspelled words	Correctness
105.	the fabrication	Determiner use (a/an/the/this, etc.)	Correctness
106.	supragingivally → supragingival	Misspelled words	Correctness
107.	while → . At the same time,	Hard-to-read text	Clarity
108.	Weak / fragile → Weak/fragile	Improper formatting	Correctness
109.	CAN BE USED	Passive voice misuse	Clarity
110.	uOmega → omega, mega, lomega	Misspelled words	Correctness
111.	uAlpha → alpha	Misspelled words	Correctness
112.	uGamma → gamma, Gama	Misspelled words	Correctness
113.	uModified → unmodified, modified	Misspelled words	Correctness
114.	anchor shaped → anchor-shaped	Misspelled words	Correctness
115.	uMetal → metal	Misspelled words	Correctness
116.	uReverse → reverse, universe	Misspelled words	Correctness
117.	<i>Retention can be increased</i>	Passive voice misuse	Clarity
118.	the addition	Determiner use (a/an/the/this, etc.)	Correctness
119.	<i>They</i>	Intricate text	Clarity
120.	the Omega	Determiner use (a/an/the/this, etc.)	Correctness
121.	<i>The use of Omega loop was introduced by Mortada and Kingasintracanal retainer in the year 2004.</i>	Passive voice misuse	Clarity

122.	A total	Determiner use (a/an/the/this, etc.)	Correctness
123.	post → rod, pole, bar, shaft	Word choice	Engagement
124.	the post, or a post	Determiner use (a/an/the/this, etc.)	Correctness
125.	is → are	Faulty subject-verb agreement	Correctness
126.	inside the → inside the	Improper formatting	Correctness
127.	The remaining	Determiner use (a/an/the/this, etc.)	Correctness
128.	uQuick → quick	Misspelled words	Correctness
129.	uWire → where	Misspelled words	Correctness
130.	restorative material	Improper formatting	Correctness
131.	, and	Punctuation in compound/complex sentences	Correctness
132.	it	Wordy sentences	Clarity
133.	<i>it can be done</i>	Passive voice misuse	Clarity
134.	chair-side → chairside	Confused words	Correctness
135.	uCoronal → coronal	Misspelled words	Correctness
136.	uThe → the	Misspelled words	Correctness
137.	the dentinal	Determiner use (a/an/the/this, etc.)	Correctness
138.	<i>uThe wire adaptation to the internal walls is inadequate, leading to dislodgement of the wire and radicular fracture due to excessive masticatory forces.</i>	Hard-to-read text	Clarity

139.	uHence → hence	Misspelled words	Correctness
140.	the Omega	Determiner use (a/an/the/this, etc.)	Correctness
141.	omega-shaped → omega-shaped	Misspelled words	Correctness
142.	, and	Punctuation in compound/complex sentences	Correctness
143.	extention → extension	Misspelled words	Correctness
144.	eanal → channel	Word choice	Engagement
145.	3 → three	Improper formatting	Correctness
146.	; → ."	Misuse of semicolons, quotation marks, etc.	Correctness
147.	2 → two	Improper formatting	Correctness
148.	portion → part, fragment, piece	Word choice	Engagement
149.	. A	Improper formatting	Correctness
150.	inch → inches	Incorrect noun number	Correctness
151.	post-fabrication	Misspelled words	Correctness
152.	fabrication,	Punctuation in compound/complex sentences	Correctness
153.	arms-of-wire → wire arms	Wordy sentences	Clarity
154.	bent → tilted	Word choice	Engagement
155.	it	Pronoun use	Correctness
156.	. Repeat	Improper formatting	Correctness
157.	arm → component	Word choice	Engagement

158.	. Bend	Improper formatting	Correctness
159.	arms → components	Word choice	Engagement
160.	. Cut	Improper formatting	Correctness
161.	. By	Improper formatting	Correctness
162.	end → back	Word choice	Engagement
163.	, thereby	Punctuation in compound/complex sentences	Correctness
164.	Mushroom-shaped → Mushroom-shaped	Misspelled words	Correctness
165.	, thereby	Punctuation in compound/complex sentences	Correctness
166.	. <i>Adaptation can be enhanced</i>	Passive voice misuse	Clarity
167.	, which	Punctuation in compound/complex sentences	Correctness
168.	. <i>Adaptation can be enhanced by compressing at the curved end which opens up the arms at the free end.</i>	Unclear sentences	Clarity
169.	simpler → more straightforward, more uncomplicated	Word choice	Engagement
170.	easier → more accessible, more straightforward, more effortless, more uncomplicated	Word choice	Engagement
171.	<i>macroretentive</i>	Unknown words	Correctness
172.	, dual-cured	Punctuation in compound/complex sentences	Correctness
173.	intra canal → intracanal	Confused words	Correctness

174.	<i>The objective of this technique is to increase the resistance of the restored teeth to mechanical loading by bonding the intra canal retainer.</i>	Unclear sentences	Clarity
175.	<i>macroretentive</i>	Unknown words	Correctness
176.	.The	Improper formatting	Correctness
177.	the integration of → integrating	Wordy sentences	Clarity
178.	to reinforce	Wordy sentences	Clarity
179.	the restoration	Determiner use (a/an/the/this, etc.)	Correctness
180.	an indirect	Determiner use (a/an/the/this, etc.)	Correctness
181.	They	Intricate text	Clarity
182.	, and	Punctuation in compound/complex sentences	Correctness
183.	<i>They have disadvantages like they are expensive and require an additional laboratory stage for preparation of post and they could pose problems during the natural tooth exfoliation.</i>	Unclear sentences	Clarity
184.	The short	Determiner use (a/an/the/this, etc.)	Correctness
185.	a reverse, or the reverse	Determiner use (a/an/the/this, etc.)	Correctness
186.	<i>The post is inserted upside down so that the 3-mm head into the canal and the remaining 5 mm of the threaded section was positioned out</i>	Intricate text	Clarity

	<i>of the canal as a core for coronal restoration.</i>		
187.	was → were	Faulty subject-verb agreement	Correctness
188.	canal → channel	Word choice	Engagement
189.	, and	Punctuation in compound/complex sentences	Correctness
190.	The canal	Determiner use (a/an/the/this, etc.)	Correctness
191.	in order to → to	Wordy sentences	Clarity
192.	<i>Canal is prepared almost rectangular with semi-rounded line angles in order to match with the quadrangle core of a prefabricated metal post that is planned to be placed reversely into the prepared canal.</i>	Unclear sentences	Clarity
193.	The core	Determiner use (a/an/the/this, etc.)	Correctness
194.	uEasy → easy	Misspelled words	Correctness
195.	good → pleasing	Word choice	Engagement
196.	uThe → the	Misspelled words	Correctness
197.	subsequent to → after	Wordy sentences	Clarity
198.	a post, or the post	Determiner use (a/an/the/this, etc.)	Correctness
199.	a coronal	Determiner use (a/an/the/this, etc.)	Correctness
200.	, but	Punctuation in compound/complex sentences	Correctness
201.	mushroom-shaped → mushroom-shaped	Misspelled words	Correctness

202.	<i>To prepare the undercut</i>	Misplaced words or phrases	Correctness
203.	, and	Punctuation in compound/complex sentences	Correctness
204.	. The	Improper formatting	Correctness
205.	, and	Comma misuse within clauses	Correctness
206.	is applied → has applied	Incorrect verb forms	Correctness
207.	composite short → short composite	Misplaced words or phrases	Correctness
208.	a post, or the post	Determiner use (a/an/the/this, etc.)	Correctness
209.	post → base	Word choice	Engagement
210.	4 → four	Improper formatting	Correctness
211.	low speed → low-speed, low speed	Misspelled words	Correctness
212.	canals,	Comma misuse within clauses	Correctness
213.	post selection → post-selection	Misspelled words	Correctness
214.	done → made	Incorrect phrasing	Correctness
215.	A thin	Determiner use (a/an/the/this, etc.)	Correctness
216.	<i>Thin coat of die isolation varnish should be applied</i>	Passive voice misuse	Clarity
217.	<i>A silane primer layer was applied</i>	Passive voice misuse	Clarity
218.	composite → hybrid	Word choice	Engagement
219.	, composite	Punctuation in compound/complex sentences	Correctness

220.	build-up → build-up	Misspelled words	Correctness
221.	ecomposite → hybrid	Word choice	Engagement
222.	build-up → build-up	Misspelled words	Correctness
223.	-After → after	Incomplete sentences	Correctness
224.	<i>its fabrication trial should be done</i>	Passive voice misuse	Clarity
225.	in-patient → inpatient	Confused words	Correctness
226.	the patient, or a patient	Determiner use (a/an/the/this, etc.)	Correctness
227.	post → position, base, center, bar	Word choice	Engagement
228.	, rinsing	Punctuation in compound/complex sentences	Correctness
229.	, and	Comma misuse within clauses	Correctness
230.	Fibre → Fiber	Mixed dialects of English	Correctness
231.	Fibre-based → Fiber-based	Confused words	Correctness
232.	Fibre → Fiber	Mixed dialects of English	Correctness
233.	Fibre-based → Fiber-based	Confused words	Correctness
234.	diameter → diameters	Incorrect noun number	Correctness
235.	length → lengths	Incorrect noun number	Correctness
236.	fibre → fiber	Mixed dialects of English	Correctness
237.	fibre → fiber	Mixed dialects of English	Correctness
238.	fibre → fiber	Mixed dialects of English	Correctness
239.	fibre → fiber	Mixed dialects of English	Correctness

240.	fibre → fiber	Mixed dialects of English	Correctness
241.	a resin, or the resin	Determiner use (a/an/the/this, etc.)	Correctness
242.	the resin	Determiner use (a/an/the/this, etc.)	Correctness
243.	step-wise → step-wise	Misspelled words	Correctness
244.	<i>wise preparation of this post system first removal of 2 mm of the coronal portion of the root filling should be done</i>	Passive voice misuse	Clarity
245.	. Coronal	Improper formatting	Correctness
246.	appropriately conditioned, conditioned correctly	Word choice	Engagement
247.	conditioned → prepared	Word choice	Engagement
248.	a bonding, or the bonding	Determiner use (a/an/the/this, etc.)	Correctness
249.	length,	Punctuation in compound/complex sentences	Correctness
250.	fibres → fibers	Mixed dialects of English	Correctness
251.	adequate → good	Word choice	Engagement
252.	translucency → clarity	Word choice	Clarity
253.	a great, or the great	Determiner use (a/an/the/this, etc.)	Correctness
254.	<i>These fibres have adequate translucency for cases with great esthetic appeal because they can be camouflaged inside the resin composite structure, as in cases of intracanal reinforcement.</i>	Hard-to-read text	Clarity

255.	. They	Improper formatting	Correctness
256.	. Dual	Improper formatting	Correctness
257.	ribbondfibres → ribbon fibres, ribbon fibers	Misspelled words	Correctness
258.	, and	Punctuation in compound/complex sentences	Correctness
259.	the final, or a final	Determiner use (a/an/the/this, etc.)	Correctness
260.	fibre → fiber	Mixed dialects of English	Correctness
261.	fibres → fibers	Mixed dialects of English	Correctness
262.	a resin, or the resin	Determiner use (a/an/the/this, etc.)	Correctness
263.	the advantage	Determiner use (a/an/the/this, etc.)	Correctness
264.	Stress distribution	Misspelled words	Correctness
265.	the broad	Determiner use (a/an/the/this, etc.)	Correctness
266.	The disadvantage, or A disadvantage	Determiner use (a/an/the/this, etc.)	Correctness
267.	Disadvantage → Disadvantages	Incorrect noun number	Correctness
268.	of this → of this	Improper formatting	Correctness
269.	are → is	Faulty subject-verb agreement	Correctness
270.	, which	Punctuation in compound/complex sentences	Correctness
271.	and interfere → and interfere	Improper formatting	Correctness
272.	fibre → fiber	Mixed dialects of English	Correctness

273.	a new, or the new	Determiner use (a/an/the/this, etc.)	Correctness
274.	a light, or the light	Determiner use (a/an/the/this, etc.)	Correctness
275.	light cure → light-cure	Misspelled words	Correctness
276.	of	Wrong or missing prepositions	Correctness
277.	, so	Punctuation in compound/complex sentences	Correctness
278.	it decrease	Incomplete sentences	Correctness
279.	decrease → decreases	Faulty subject-verb agreement	Correctness
280.	high stress → high-stress	Misspelled words	Correctness
281.	stress bearing → stress-bearing	Misspelled words	Correctness
282.	the resin	Determiner use (a/an/the/this, etc.)	Correctness
283.	they are	Incomplete sentences	Correctness
284.	in order to → to	Wordy sentences	Clarity
285.	rigidity,	Punctuation in compound/complex sentences	Correctness
286.	, after	Punctuation in compound/complex sentences	Correctness
287.	. The	Improper formatting	Correctness
288.	cured → fixed	Word choice	Engagement
289.	fibre → fiber	Mixed dialects of English	Correctness
290.	post → position, seat, base, shaft	Word choice	Engagement

291.	the retention of → retaining	Wordy sentences	Clarity
292.	-.Eg → —Eg	Incomplete sentences	Correctness
293.	Eg. → E.g.	Comma misuse within clauses	Correctness
294.	. Everstick	Improper formatting	Correctness
295.	an Everstick	Determiner use (a/an/the/this, etc.)	Correctness
296.	fibre → fiber	Mixed dialects of English	Correctness
297.	systems → system	Incorrect noun number	Correctness
298.	fiber based → fiber-based	Misspelled words	Correctness
299.	a passive → an inactive	Word choice	Engagement
300.	in colour	Wordy sentences	Clarity
301.	colour → color	Mixed dialects of English	Correctness
302.	parallel sided → parallel-sided	Misspelled words	Correctness
303.	, and	Comma misuse within clauses	Correctness
304.	<i>cylindro-conical</i>	Unknown words	Correctness
305.	post → base, shaft	Word choice	Engagement
306.	in order to → to	Wordy sentences	Clarity
307.	the tooth, or a tooth	Determiner use (a/an/the/this, etc.)	Correctness
308.	build up → build-up	Misspelled words	Correctness
309.	A successful	Determiner use (a/an/the/this, etc.)	Correctness
310.	in combination → combined	Wordy sentences	Clarity

311.	),	Punctuation in compound/complex sentences	Correctness
312.	<i>The pulps were removed</i>	Passive voice misuse	Clarity
313.	, and	Punctuation in compound/complex sentences	Correctness
314.	<i>complete biological preparation was done</i>	Passive voice misuse	Clarity
315.	<i>GHz and 100 W output, at five working cycles in 6% H2O2.</i>	Incomplete sentences	Correctness
316.	degree → degrees	Incorrect noun number	Correctness
317.	<i>it was used</i>	Passive voice misuse	Clarity
318.	degree → degrees	Incorrect noun number	Correctness
319.	the patient	Determiner use (a/an/the/this, etc.)	Correctness
320.	from	Wordy sentences	Clarity
321.	the post, or a post	Determiner use (a/an/the/this, etc.)	Correctness
322.	the extension, or an extension	Determiner use (a/an/the/this, etc.)	Correctness
323.	the short, or a short	Determiner use (a/an/the/this, etc.)	Correctness
324.	a period of time → some time, a while	Wordy sentences	Clarity
325.	, and	Comma misuse within clauses	Correctness
326.	, which	Punctuation in compound/complex sentences	Correctness

327.	<i>· The destruction of the tooth structure frequently involves the entire crown leaving just the root dentine for bonding of the restorative material and thus increasing the failure rate.</i>	Unclear sentences	Clarity
328.	placed over → placed over	Improper formatting	Correctness
329.	canal → channel	Word choice	Engagement
330.	the post	Determiner use (a/an/the/this, etc.)	Correctness
331.	, Glass	Punctuation in compound/complex sentences	Correctness
332.	dentitiondue → dentition due	Misspelled words	Correctness
333.	post → center	Word choice	Engagement
334.	the adult	Determiner use (a/an/the/this, etc.)	Correctness
335.	, so	Punctuation in compound/complex sentences	Correctness
336.	the post, or a post	Determiner use (a/an/the/this, etc.)	Correctness
337.	the primary, or a primary	Determiner use (a/an/the/this, etc.)	Correctness
338.	<i>selection; Selection</i>	Text inconsistencies	Correctness
339.	post placement → post-placement	Misspelled words	Correctness
340.	The remaining	Determiner use (a/an/the/this, etc.)	Correctness
341.	technique → technical	Confused words	Correctness
342.	like	Inappropriate colloquialisms	Delivery

343.	the post, or a post	Determiner use (a/an/the/this, etc.)	Correctness
344.	teeth,	Punctuation in compound/complex sentences	Correctness
345.	coronal extension	Improper formatting	Correctness
346.	the post	Determiner use (a/an/the/this, etc.)	Correctness
347.	3 mm radicular extension and 2-3 mm coronal extension of post should be used	Passive voice misuse	Clarity
348.	be used to	Wordy sentences	Clarity
349.	a composite, or the composite	Determiner use (a/an/the/this, etc.)	Correctness
350.	used,	Punctuation in compound/complex sentences	Correctness
351.	mushroom-shaped → mushroom-shaped	Misspelled words	Correctness
352.	the retention of → retaining	Wordy sentences	Clarity
353.	the composite, or a composite	Determiner use (a/an/the/this, etc.)	Correctness
354.	· Fibre posts can also be used	Passive voice misuse	Clarity
355.	fibre → fiber	Mixed dialects of English	Correctness
356.	polyethelenefibre	Unknown words	Correctness
357.	· Biologic post can also be successfully used	Passive voice misuse	Clarity
358.	a tooth	Determiner use (a/an/the/this, etc.)	Correctness

359.	completely → entirely, ultimately	Word choice	Engagement
360.	the type	Determiner use (a/an/the/this, etc.)	Correctness
361.	<i>· Coronal restoration should be done</i>	Passive voice misuse	Clarity
362.	restorative → therapeutic	Word choice	Clarity
363.	Full → Complete	Word choice	Engagement
364.	a must	Determiner use (a/an/the/this, etc.)	Correctness
365.	<i>of the beauty of the mouth of infants and children through adolescence, including those with special</i>	Research Aesthetic Crowns for Restoring Anterior Primary ... https://openventio.org/ventio_new1/wp-content/uploads/2017/07/Aesthetic-Crowns-for-Restoring-Anterior-Primary-Incisors-TCOJ-1-109.pdf	Originality
366.	<i>dental treatment and the concerned parents. It is also challenging for pediatric dentists to</i>	POSTS IN PRIMARY TEETH-A SILE FOR BETTER SMILE - CORE https://core.ac.uk/display/103998576	Originality
367.	<i>to maintain function and prevent changes in mastication, phonetics, development of</i>	POSTS IN PRIMARY TEETH-A SILE FOR BETTER SMILE - CORE https://core.ac.uk/display/103998576	Originality
368.	<i>Clinicians have made several attempts to restore such grossly carious primary anterior teeth with different and</i>	POSTS IN PRIMARY TEETH-A SILE FOR BETTER SMILE - CORE https://core.ac.uk/display/103998576	Originality
369.	<i>development of para-functional habits and psychological problems that</i>	POSTS IN PRIMARY TEETH-A SILE FOR BETTER SMILE - CORE https://core.ac.uk/display/103998576	Originality
370.	<i>of a post is to retain the coronal restoration in an endodontically</i>	Current perspectives on post systems: a literature review ...	Originality

	<i>treated tooth that has suffered an extensive loss of crown structure.</i>	https://onlinelibrary.wiley.com/doi/full/10.1111/j.1834-7819.2010.01298.x	
371.	<i>for decades. More recently, in response to the request for tooth-coloured posts, several non-metallic dowels have been marketed. Among them, epoxy resin posts reinforced with carbon fibres, epoxy or methacrylate resin posts reinforced with quartz or glass fibres, zirconia posts, and polyethylene fi...</i>	Current perspectives on post systems: a literature review ... https://onlinelibrary.wiley.com/doi/full/10.1111/j.1834-7819.2010.01298.x	Originality
372.	<i>It has good physical and mechanical properties and</i>	What Is Aramid Flame Retardant Fabric - Fabric information ... https://www.tex-safety.com/news/what-is-aramid-flame-retardant-fabric-32273337.html	Originality
373.	<i>It has high tensile strength and the tooth can be prepared for a crown immediately after polymerization.</i>	JOURNAL OF EVOLUTION OF MEDICAL AND DENTAL SCIENCES https://jemds.com/latest-articles.php?at_id=366	Originality
374.	<i>It is tooth colored and can be used under translucent restorations without affecting the esthetic</i>	JOURNAL OF EVOLUTION OF MEDICAL AND DENTAL SCIENCES https://jemds.com/latest-articles.php?at_id=366	Originality
375.	<i>HISTORY In 1728, Pierre Fauchard described the use of "TENONS" which were metal posts screwed into the roots of teeth to retain the prosthesis. 1745 – Claude Mouton published his design of a gold crown with a gold post that was to be inserted into the root. 1830-1870 – Wood replaced metal as the m...</i>	Post and core - SlideShare https://www.slideshare.net/khansana/post-and-core-134447123	Originality
376.	<i>An ideal post and core should be resorbable but it should provide adequate retention and resistance. Post should be well adapted to the inner dentinal wall as it is one of the</i>	POSTS IN PRIMARY TEETH-A SILE FOR BETTER SMILE - CORE https://core.ac.uk/display/103998576	Originality

factors governing factors for the retention of the restoration.

377.	<i>Provide maximal retentiveness to the core. Physical properties compatible to core Maximum retention with minimum removal of dentin Even distribution of functional stresses along root surfaces Esthetic compatibility Minimal stress during placement and cementation Resistance to displacement. E...</i>	Post and core - SlideShare https://www.slideshare.net/khansana/post-and-core-134447123	Originality
378.	<i>CONTRAINDICATIONS Severe curvature of the root-eg: Dilacerations of the root. Persistent periapical lesion Poor periodontal health Poor crown to root ratio Weak / fragile roots Teeth with heavy occlusal contacts Patients with unusual and occupational habits Economic factors Inadequate skill.</i>	Post and core - SlideShare https://www.slideshare.net/khansana/post-and-core-134447123	Originality
379.	<i>wire adaptation to the internal walls is inadequate, leading to dislodgement of the wire and radicular fracture due to excessive masticatory forces.</i>	Modified Anchor Shaped Post Core Design for Primary ... https://www.hindawi.com/journals/crid/2014/306910/	Originality
380.	<i>to increase the potential surface area for attachment of the restorative material and consequently increase the long-term stability of an esthetic restoration.</i>	Rehabilitation of severely mutilated teeth under general ... https://www.jisppd.com/article.asp?issn=0970-4388;year=2010;volume=28;issue=1;spage=42;epage=44;aulast=Navit	Originality
381.	<i>A 19-gauge orthodontic wire, 1.5 inch in length, is bent using a universal plier.</i>	Modified Anchor Shaped Post Core Design for Primary ... https://www.hindawi.com/journals/crid/2014/306910/	Originality
382.	<i>Repeat the same procedure for the other arm.</i>	Modified Anchor Shaped Post Core Design for Primary ... https://www.hindawi.com/journals/crid/2014/306910/	Originality

383.	<i>Bend the free end of the arms towards the curved end.</i>	Modified Anchor Shaped Post Core Design for Primary ... https://www.hindawi.com/journals/crid/2014/306910/	Originality
384.	<i>By compressing the curved end, the free end opens up to adapt to the walls of the root thereby giving extra mechanical retention. Excess compression is not advised as it may cause root fracture. The post is placed in the prepared root canal and checked for adaptation. Mushroom shaped retention groo...</i>	Modified Anchor Shaped Post Core Design for Primary ... https://www.hindawi.com/journals/crid/2014/306910/	Originality
385.	<i>The free end has two arms crisscrossing to the opposite side which adapt to the walls of the</i>	Modified Anchor Shaped Post Core Design for Primary ... https://www.hindawi.com/journals/crid/2014/306910/	Originality
386.	<i>The curved end provides strength to the coronal structure. · Adaptation can be enhanced by compressing at the curved end which opens up the arms at the free end. · Hence it is a simpler, easier, and inexpensive technique for treating severely damaged teeth.</i>	Modified Anchor Shaped Post Core Design for Primary ... https://www.hindawi.com/journals/crid/2014/306910/	Originality
387.	<i>The round macroretentive elements in Ni-Cr cast posts offer a better distribution of masticatory loading forces. The possibility of chemical/mechanical adhesion by using adhesive systems allows for the integration of</i>	Primary anterior tooth restoration using posts with ... http://www.quintpub.com/userhome/qi/qi_30_6_wanderley_10.pdf	Originality
388.	<i>structure. These posts are indicated for the reinforcement of enlarged canals, considering that limited amounts of dentin tissue are available, which is a common situation during restoration of primary anterior teeth. They are prefabricated in several diameters, and therefore can be readily used.</i>	Primary anterior tooth restoration using posts with ... http://www.quintpub.com/userhome/qi/qi_30_6_wanderley_10.pdf	Originality

389.	<i>High tensile strength, Increased fatigue resistance and inherent rigidity, Increased resistance to corrosion, biocompatibility to different core materials, Good chemical bonding to Bis-GMA resins, A young modulus of elasticity approaching that of dentin</i>	Evaluation of 2 different post systems http://www.kau.edu.sa/Files/165/Researches/540_Evaluation%20of%20different%20post%20systems.pdf	Originality
390.	<i>Coronal structures and pulp chamber were etched and conditioned</i>	Esthetic rehabilitation of anterior primary teeth using ... https://www.jisppd.com/article.asp?issn=0970-4388;year=2011;volume=29;issue=4;spage=327;epage=332;aulast=Jain	Originality
391.	<i>Polyethylene fibers conditioned with bonding agent, placed in the slot of the root canal,</i>	Esthetic rehabilitation of anterior primary teeth using ... https://www.jisppd.com/article.asp?issn=0970-4388;year=2011;volume=29;issue=4;spage=327;epage=332;aulast=Jain	Originality
392.	<i>Carbon fiber based posts are essentially composite materials. They are made of equally stretched and continuous aligned unidirectional carbon fibers,</i>	Evaluation of 2 different post systems http://www.kau.edu.sa/Files/165/Researches/540_Evaluation%20of%20different%20post%20systems.pdf	Originality
393.	<i>The carbon fiber post is a passive post,</i>	Evaluation of 2 different post systems http://www.kau.edu.sa/Files/165/Researches/540_Evaluation%20of%20different%20post%20systems.pdf	Originality
394.	<i>Yttrium oxide was added as a stabilizing agent. Ceramic post has a cylindro-conical design, where the post tapers in its apical third in order to preserve tooth structure and to facilitate cementation.</i>	Evaluation of 2 different post systems http://www.kau.edu.sa/Files/165/Researches/540_Evaluation%20of%20different%20post%20systems.pdf	Originality
395.	<i>outstanding esthetics, resulting from</i>	Evaluation of 2 different post	Originality

	<i>the optical properties of the post material,</i>	systems http://www.kau.edu.sa/Files/165/Researches/540_Evaluation%20of%20different%20post%20systems.pdf	
396.	<i>The post can be used directly using composite core or indirectly using the heat pressed technique to achieve a ceramic core build up.</i>	Evaluation of 2 different post systems http://www.kau.edu.sa/Files/165/Researches/540_Evaluation%20of%20different%20post%20systems.pdf	Originality
397.	<i>Successful alternative to restore function and esthetics in children with badly decayed primary anterior teeth.</i>	Evaluation of 2 different post systems http://www.kau.edu.sa/Files/165/Researches/540_Evaluation%20of%20different%20post%20systems.pdf	Originality
398.	<i>to describe an alternative technique that uses adhesive capabilities of materials in combination with strategic placement of parts of extracted human teeth.</i>	Comparative in vivo evaluation of restoring severely ... https://www.jisppd.com/article.asp?issn=0970-4388;year=2008;volume=26;issue=4;spage=141;epage=148;aualast=Grewal	Originality
399.	<i>used teeth from the Human Tooth Bank of Sao Paulo University Dental School to be used as natural posts and crowns to fit into the roots and replace the crowns as well.</i>	Comparative in vivo evaluation of restoring severely ... https://www.jisppd.com/article.asp?issn=0970-4388;year=2008;volume=26;issue=4;spage=141;epage=148;aualast=Grewal	Originality
400.	<i>Tooth bank procedure The collected samples of extracted teeth were thoroughly scaled, polished, and freed of soft tissues and periodontal remnants.</i>	Comparative in vivo evaluation of restoring severely ... https://www.jisppd.com/article.asp?issn=0970-4388;year=2008;volume=26;issue=4;spage=141;epage=148;aualast=Grewal	Originality
401.	<i>The pulps were removed from root canals and complete biological preparation was done.</i>	Comparative in vivo evaluation of restoring severely ...	Originality

		https://www.jisppd.com/article.asp?issn=0970-4388;year=2008;volume=26;issue=4;spage=141;epage=148;aualast=Grewal	
402.	<i>After preparation, all the sample teeth were placed in the ultrasonic tank operating at 42 GHz and 100 W output, at five working cycles in 6</i>	Comparative in vivo evaluation of restoring severely ... https://www.jisppd.com/article.asp?issn=0970-4388;year=2008;volume=26;issue=4;spage=141;epage=148;aualast=Grewal	Originality
403.	<i>Tooth selected and prepared for use as biological restoration</i>	Comparative in vivo evaluation of restoring severely ... https://www.jisppd.com/article.asp?issn=0970-4388;year=2008;volume=26;issue=4;spage=141;epage=148;aualast=Grewal	Originality
404.	<i>The morphology and histology of primary teeth present a</i>	Esthetic rehabilitation of anterior primary teeth using ... https://www.jisppd.com/article.asp?issn=0970-4388;year=2011;volume=29;issue=4;spage=327;epage=332;aualast=Jain	Originality
405.	<i>The destruction of the tooth structure frequently involves the entire crown leaving just the root dentine for bonding of the restorative material</i>	Esthetic rehabilitation of anterior primary teeth using ... https://www.jisppd.com/article.asp?issn=0970-4388;year=2011;volume=29;issue=4;spage=327;epage=332;aualast=Jain	Originality
406.	<i>Following conclusions can be made from this review</i>	Dental Imaging - advances in conventional and digital ... https://www.plattevalleyendodontics.com/wp-content/uploads/2019/01/Dental-Imaging-advances.pdf	Originality

case report

by MIDSr Dental

General metrics

11,913

characters

1,737

words

99

sentences

6 min 56 secreading
time**13 min 21 sec**speaking
time

Score

**60**

Writing Issues

138

Issues left

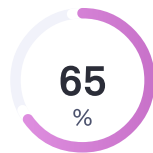
70

Critical

68Advanced

This text scores better than 60%
of all texts checked by Grammarly

Plagiarism

**65**

%

29

sources

65% of your text matches 29 sources on the web
or in archives of academic publications

Writing Issues

15	Engagement	
15	Word choice	
30	Clarity	
7	Wordy sentences	
10	Hard-to-read text	
5	Unclear sentences	
6	Passive voice misuse	
2	Word choice	
93	Correctness	
2	Pronoun use	
6	Wrong or missing prepositions	
18	Misspelled words	
12	Punctuation in compound/complex sentences	
27	Determiner use (a/an/the/this, etc.)	
3	Unknown words	
6	Faulty subject-verb agreement	
5	Comma misuse within clauses	
5	Closing punctuation	
2	Incorrect verb forms	
2	Improper formatting	
1	Misuse of modifiers	
1	Misplaced words or phrases	
1	Mixed dialects of english	
2	Incomplete sentences	

Unique Words

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Measures depth of vocabulary by identifying words that are not among the 5,000 most common English words.

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Word Length

Measures average word length

5.4characters per word

Sentence Length

Measures average sentence length

17.5words per sentence

case report

Management of Impacted Mesiodens: A case report

139

Introduction

140

A supernumerary tooth is a developmental anomaly of number characterized by the presence of tooth, in addition to the normal tooth series. The prevalence varies between 0.3% and 3.8% of the population. This anomaly of unknown etiology is more found in permanent dentition and in boys. Supernumerary teeth may occur as a single isolated anomaly or in association with specific developmental syndromes such as cleft lip and palate, down syndromes, cleidocranial dysplasia, and Gardner's syndrome. Supernumerary teeth in the maxillary anterior region may also compromise facial esthetics.¹

The atypical and often unerupted supernumerary teeth present between the central maxillary incisors are called mesiodens because of its central position and which accounts around 80% of all supernumerary teeth. They have been categorized according to their shape and size: eumorphic (resembling the central incisors with normal shape and size) or dysmorphic (teeth with variable size and shape).² Based on their morphology; mesiodens shape may be conical, tuberculate, odontome, or may closely resemble to the normal tooth series. Mesiodens can occur individually or as multiples called as mesiodentes.¹ A mesiodens may erupt normally, stay impacted, appear inverted, or take a horizontal position series. When they are inverted, the chances of eruption into the oral cavity are very less¹

Supernumerary is the given denomination to the tooth which results from the hyperdontia, a developmental alteration.³ The etiology most widely accepted is the hyperactivity of the dental lamina and the theories includes the

combination of genetic and environmental factors in human odontogenesis as dynamic interactions.²⁰

There are several theories suggesting possible etiological factors to this alteration in the ordinary number of teeth, as phylogenetic reversion,

143 dichotomy of a tooth germ and hyperativity of the dental lamina²¹3palatal²²offshoot from continued²³activity of the dental lamina after the normal number²⁴of tooth buds are formed, and atavism.^{25,26}²⁷

Genetics and consanguineous marriages are also considered as²⁸ etiological factors. Only 25% of the maxillary anterior supernumerary teeth erupt, and they cause complications including²⁹ retention of the permanent teeth abnormal³⁰ root development, crowding, and

144 spacing of the anterior teeth. They are usually asymptomatic and may be discovered during radiological³¹ examination of the premaxillary area³²

145 Mesiodens may give rise to a variety of complications such as impaction, delayed eruption, ectopic eruption of adjacent teeth, crowding, malalignment of incisors, midline diastema, displacement and axial rotation of adjacent teeth, dilacerations, radicular resorption of adjacent teeth, possible development of dentigerous cyst and migration into nasal³³ cavity or maxillary sinus, and fistula between oral and nasal cavity series³

This case report describes a palatally impacted mesiodens causing excessive midline diastema between permanent central incisors and also describes the treatment planning.³⁴

Case report

146 A 10 year old male patient came to the department of Pediatric and Preventive Dentistry in the MIDSR Dental College and Hospital with a chief complaint of his unaesthetic malaligned anterior teeth and excessive space between front³⁵³⁶teeth.³⁷

147 There was no associated history of trauma and pain. Medical history and family history was³⁸ asked and was³⁹ noncontributory. There were no signs of any

148 syndrome. On intraoral examination, it was observed⁴⁰ that 21 was erupted⁴¹ and 11 was not yet erupted patient have⁴² excessive midline diastema giving unaesthetic⁴³ appearance. Intraoral periapical (IOPA) radiograph and occlusal radiograph⁴⁴ showed the presence of unerupted mesiodentes⁴⁵ located palatal to 11. Blood investigations were done⁴⁶, and the reports were within normal limits. Treatment was planned⁴⁸ to remove palatally impacted mesiodense⁴⁹ after the surgical exposure of full-thickness palatal flap was raised from the right lateral incisor to the left lateral incisor⁵⁰. On flap reflection, mesiodens was⁵¹ noticed and were removed after minimum bone removal. The palatal flap was placed back, and interrupted sutures were placed Later⁵², IOPA⁵³ radiograph was taken to confirm the extracted mesiodens and retained incisors. Following the removal of sutures 1⁵⁴ week later, the patient was scheduled for monthly recalls. The wound healing was uneventful, and the patient presented with no postoperative complications.

Preoperative Photographs

Front view of complete occlusion was taken using check retractor and preoperative⁵⁶ maxillary arch was taken⁵⁷ in the rare view using intraoral mirror⁵⁸ and⁵⁵

Preoperative radiographs

IOPA Radiograph Occlusal Radiograph

Palatal Flap Raised and Palatal bone drilled to expose mesiodens and extraction of mesiodens was done⁶⁰

Postoperative Photographs

Immediate⁶¹ follow up After 7⁶² days postoperative IOPA

151 Discussion

152 The term of mesiodens⁶³ is used to refer to an unerupted supernumerary tooth in
 152 the midline of maxilla⁶⁵ between the central incisors.⁶⁴ Mesiodens is defined as
 153 an extra tooth along with normal⁶⁶ teeth with the prevalence of 0.15%–1.9%.⁶⁵
 153 One mesiodens occurred in 78.1% of the cases and two in 21.9% of the cases.
 154 Most of the mesiodentes⁶⁷ (55.2%) were found to be in a vertical position (55.2%)
 154 followed by inverted⁶⁸ position (37.6%) and horizontal position (7%).⁶⁹ Most of the
 mesiodens remain unerupted, and if they are erupting, it will be an ectopic
 eruption.³ The inverted and transversely aligned mesiodens never erupt into
 the oral cavity.³

155 The maximum incidence of mesiodens reported⁷⁰ between 7 and 9 years of age.
 This observation may be due to the fact that⁷¹ maxillary permanent central
 incisors erupt at this age. Radiological examination of noneruption⁷² or axial
 rotation of the upper central incisors or diastema might reveal the presence of
 mesiodens. The treatment of impacted mesiodens centers on several factors
which include the age of the child, clinical manifestation, capacity of the child⁷³
to tolerate the surgical procedure, and root development stage of the adjacent⁷⁴
permanent teeth.⁷⁵ In case presented here there was diastema present because⁷⁶
of the unerupted palatally placed mesiodens because of which patient showed⁷⁷
unaesthetic appearance.⁷⁸⁷⁹

156 If the mesiodentes⁸⁰ remains asymptomatic, the supernumerary teeth are left in
 place or⁸¹ the extraction is delayed until root formation of the adjacent teeth is
 157 completed.⁸² Wait and see the behavior is indicated, while⁸³ mesiodens extraction

is discouraged due to the risk of iatrogenic damage to the permanent teeth or due to the risk of affecting the vitality of the permanent teeth.⁹

158 In addition, early surgical intervention in a young child requires the treatment⁸⁵
under general anesthesia with complication risks, and it might create
159 psychological, dental anxiety.⁶ Supernumerary teeth may remain in the jaw for
years without any complications; however, they should be observed⁸⁶ periodically
as they may as well cause cystic complications (in about 4%–9% of cases),
development of a carcinoma

As long as the coronal part of the follicle of the supernumerary teeth remains intact, migration of the supernumerary teeth is possible which⁸⁸ can cause some disturbance in eruption or alignment of permanent dentition resulting in the extraction during mixed dentition⁸⁹

However, in this present case, the upper left central incisors had already erupted into the oral cavity while^{90,91} the eruption of the upper right central incisors
was hindered⁹² due to the presence of palatally impacted supernumerary tooth.

Furthermore, possibility⁹³ of eruption⁹⁴ of mesiodens was less and⁹⁵ eruption^{96,97} of right⁹⁸ central incisor was delayed. Also, patient's⁹⁹ aesthetic appearance was compromised. There was¹⁰⁰ chances of initiation radicular resorption of central
160 incisors if waited for eruption¹⁰¹ of the tooth. Due to these ongoing and future complications, the impacted mesiodens were indicated for extraction.

Nevertheless, the extraction that has been done at the right time, in this case, can prevent the complications¹⁰². Fortunately, the postsurgical phase was uneventful in this surgical intervention.

161 During the surgical removal of impacted supernumerary teeth in the maxillary anterior region, complications or disturbances to adjacent teeth with incomplete root development compared to the surgery postponed for complete root development of incisors has not been reported.

Early intervention and surgical removal of mesiodentes as soon it is detected will prevent the future complications such as retarded or delayed eruption of incisors, future more invasive surgical procedures, crowding, space loss, unfavourable permanent tooth resorptions and midline shifts which may require extensive orthodontic therapy. Therefore, an impacted supernumerary tooth should be extracted as soon as it is diagnosed at a young age when it appears to cause damage to adjacent teeth.^{6,7}

The spontaneous eruption of impacted maxillary incisors after removal of the supernumerary teeth depends on the several factors such as the depth of the impacted tooth, amount of root development, the angulation of the impacted tooth, and the available space required for its eruption. Therefore, immediate orthodontic extrusive traction results in eruption of the impacted incisors following the surgical removal of the supernumerary teeth.¹⁰ Thus, avoid the need for the second surgery. Moreover, it has been suggested that early exposure and bonding the unerupted incisor may result in loss of supporting bone and create scar tissue, which may further delay its eruption⁶

Conclusion

Supernumerary teeth are of huge concern to both dentist and patient because of its potential problems and complications. Radiographic evaluation of erupted supernumerary teeth is important in the accidental detection of unerupted mesiodens. On diagnosis, every case should be treated properly to lessen problems to the developing tooth buds and dentition. Careful history taking, clinical and radiographic examinations can provide important information required for the diagnosis of such conditions. Early diagnosis and appropriate treatment of such cases can help to prevent physiological, aesthetics and functional problems associated with dens invaginatus. Once

surgical removal of mesiodens is advised, long-term follow-up of treated case¹²⁸ is required.¹²⁹

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1.	normal → regular, standard	Word choice	Engagement
2.	in	Wordy sentences	Clarity
3.	<i>Supernumerary teeth may occur as a single isolated anomaly or in association with specific developmental syndromes such as cleft lip and palate, down syndromes, cleidocranial dysplasia, and Gardner's syndrome.</i>	Hard-to-read text	Clarity
4.	its → their	Pronoun use	Correctness
5.	for around	Wrong or missing prepositions	Correctness
6.	<i>The atypical and often unerupted supernumerary teeth present between the central maxillary incisors are called mesiodens because of its central position and which accounts around 80% of all supernumerary teeth.</i>	Hard-to-read text	Clarity
7.	eumorphic → geomorphic	Misspelled words	Correctness
8.	normal → standard, regular	Word choice	Engagement
9.	morphology; → morphology,	Punctuation in compound/complex sentences	Correctness
10.	the mesiodens	Determiner use (a/an/the/this, etc.)	Correctness
11.	odontome → odontoma	Misspelled words	Correctness
12.	to	Wrong or missing prepositions	Correctness
13.	to	Wordy sentences	Clarity
14.	normal → regular, standard	Word choice	Engagement
15.	as	Wrong or missing prepositions	Correctness

16.	mesiodentes → residents, mesiodens	Misspelled words	Correctness
17.	hyperdontia	Unknown words	Correctness
18.	, and	Punctuation in compound/complex sentences	Correctness
19.	includes → include	Faulty subject-verb agreement	Correctness
20.	<i>3 The etiology most widely accepted is the hyperactivity of the dental lamina and the theories includes the combination of genetic and environmental factors in human odontogenesis as dynamic interactions.</i>	Hard-to-read text	Clarity
21.	the dichotomy, or a dichotomy	Determiner use (a/an/the/this, etc.)	Correctness
22.	, and	Comma misuse within clauses	Correctness
23.	hyperativity → hyperactivity	Misspelled words	Correctness
24.	the continued	Determiner use (a/an/the/this, etc.)	Correctness
25.	normal → average	Word choice	Engagement
26.	normal → average, usual, standard, typical	Word choice	Engagement
27.	<i>There are several theories suggesting possible etiological factors to this alteration in the ordinary number of teeth, as phylogenetic reversion, dichotomy of a tooth germ and hyperativity of the dental lamina3palatal offshoot from continued activity of the dental lamina after the normal number of ...</i>	Unclear sentences	Clarity
28.	as	Wrong or missing prepositions	Correctness

29.	, including	Punctuation in compound/complex sentences	Correctness
30.	, abnormal	Punctuation in compound/complex sentences	Correctness
31.	the radiological	Determiner use (a/an/the/this, etc.)	Correctness
32.	area.	Closing punctuation	Correctness
33.	the nasal	Determiner use (a/an/the/this, etc.)	Correctness
34.	<i>This case report describes a palatally impacted mesiodens causing excessive midline diastema between permanent central incisors and also describes the treatment planning.</i>	Unclear sentences	Clarity
35.	10-year-old → 10-year-old	Misspelled words	Correctness
36.	department → Department	Misspelled words	Correctness
37.	<i>A 10 year old male patient came to the department of Pediatric and Preventive Dentistry in the MIDSR Dental College and Hospital with a chief complaint of his unaesthetic malaligned anterior teeth and excessive space between front teeth.</i>	Unclear sentences	Clarity
38.	was → were	Faulty subject-verb agreement	Correctness
39.	was → were	Faulty subject-verb agreement	Correctness
40.	<i>it was observed</i>	Passive voice misuse	Clarity
41.	was erupted → erupted, has erupted	Incorrect verb forms	Correctness
42.	have → has	Faulty subject-verb agreement	Correctness
43.	an unaesthetic	Determiner use (a/an/the/this, etc.)	Correctness

		etc.)	
44.	radioghaph → radiograph, radiography	Misspelled words	Correctness
45.	mesiodentes → mesiodens, residences	Misspelled words	Correctness
46.	<i>Intraoral periapical (IOPA) radiograph and occlusal radioghaph showed the presence of unerupted mesiodentes located palatal to 11.</i>	Hard-to-read text	Clarity
47.	<i>Blood investigations were done</i>	Passive voice misuse	Clarity
48.	<i>Treatment was planned</i>	Passive voice misuse	Clarity
49.	mesiodense → mesiodens	Misspelled words	Correctness
50.	incisor.	Closing punctuation	Correctness
51.	was → were	Faulty subject-verb agreement	Correctness
52.	. Later	Punctuation in compound/complex sentences	Correctness
53.	an IOPA	Determiner use (a/an/the/this, etc.)	Correctness
54.	± → one	Improper formatting	Correctness
55.	, and	Punctuation in compound/complex sentences	Correctness
56.	the preoperative	Determiner use (a/an/the/this, etc.)	Correctness
57.	taken → born	Word choice	Engagement
58.	an intraoral, or the intraoral	Determiner use (a/an/the/this, etc.)	Correctness
59.	mirror.	Closing punctuation	Correctness

60.	done.	Closing punctuation	Correctness
61.	Immediate → Immediately	Misuse of modifiers	Correctness
62.	7 → seven	Improper formatting	Correctness
63.	of	Wrong or missing prepositions	Correctness
64.	is used to refer → refers	Wordy sentences	Clarity
65.	the maxilla	Determiner use (a/an/the/this, etc.)	Correctness
66.	normal → regular	Word choice	Engagement
67.	mesiodentes → residents, mesiodens	Misspelled words	Correctness
68.	an inverted	Determiner use (a/an/the/this, etc.)	Correctness
69.	, and if → . If	Hard-to-read text	Clarity
70.	was reported	Incorrect verb forms	Correctness
71.	due to the fact that → because, since	Wordy sentences	Clarity
72.	noneruption → noneruptive	Misspelled words	Correctness
73.	, which	Punctuation in compound/complex sentences	Correctness
74.	the capacity	Determiner use (a/an/the/this, etc.)	Correctness
75.	<i>The treatment of impacted mesiodens centers on several factors which include the age of the child, clinical manifestation, capacity of the child to tolerate the surgical procedure, and root development</i>	Unclear sentences	Clarity

	<i>stage of the adjacent permanent teeth.</i>		
76.	the case	Determiner use (a/an/the/this, etc.)	Correctness
77.	here,	Punctuation in compound/complex sentences	Correctness
78.	, because	Punctuation in compound/complex sentences	Correctness
79.	the patient	Determiner use (a/an/the/this, etc.)	Correctness
80.	an unaesthetic	Determiner use (a/an/the/this, etc.)	Correctness
81.	<i>In case presented here there was diastema present because of the unerupted palatally placed mesiodens because of which patient showed unaesthetic appearance.</i>	Hard-to-read text	Clarity
82.	mesiodentes → residents	Misspelled words	Correctness
83.	, or	Punctuation in compound/complex sentences	Correctness
84.	, while → . In contrast,	Hard-to-read text	Clarity
85.	the treatment	Determiner use (a/an/the/this, etc.)	Correctness
86.	<i>they should be observed</i>	Passive voice misuse	Clarity
87.	<i>periodically</i>	Misplaced words or phrases	Correctness
88.	, which	Punctuation in compound/complex sentences	Correctness
89.	dentition.	Closing punctuation	Correctness
90.	, while	Punctuation in	Correctness

		compound/complex sentences	
91.	while → . In contrast,	Hard-to-read text	Clarity
92.	<i>the eruption of the upper right central incisors was hindered</i>	Passive voice misuse	Clarity
93.	the possibility	Determiner use (a/an/the/this, etc.)	Correctness
94.	eruption → outbreak, explosion	Word choice	Engagement
95.	, and	Comma misuse within clauses	Correctness
96.	eruption → discharge	Word choice	Engagement
97.	the eruption	Determiner use (a/an/the/this, etc.)	Correctness
98.	the right	Determiner use (a/an/the/this, etc.)	Correctness
99.	the patient's	Determiner use (a/an/the/this, etc.)	Correctness
100.	was → were	Faulty subject-verb agreement	Correctness
101.	the eruption, or an eruption	Determiner use (a/an/the/this, etc.)	Correctness
102.	the complications	Determiner use (a/an/the/this, etc.)	Correctness
103.	mesiodentes → residents	Misspelled words	Correctness
104.	the future	Determiner use (a/an/the/this, etc.)	Correctness
105.	unfavourable → unfavorable	Mixed dialects of English	Correctness
106.	, and	Comma misuse within clauses	Correctness
107.	<i>Early intervention and surgical</i>	Hard-to-read text	Clarity

removal of mesiodentes as soon it is detected will prevent the future complications such as retarded or delayed eruption of incisors, future more invasive surgical procedures, crowding, space loss, unfavourable permanent tooth resorptions and midline shifts which may..

108.	removal of → removing	Wordy sentences	Clarity
109.	supernumerary → redundant	Word choice	Clarity
110.	the several	Determiner use (a/an/the/this, etc.)	Correctness
111.	impacted → affected	Word choice	Engagement
112.	impacted → affected	Word choice	Engagement
113.	an eruption	Determiner use (a/an/the/this, etc.)	Correctness
114.	eruption → discharge, combustion	Word choice	Engagement
115.	supernumerary → redundant	Word choice	Clarity
116.	<i>Therefore, immediate orthodontic extrusive traction results in eruption of the impacted incisors following the surgical removal of the supernumerary teeth.</i>	Hard-to-read text	Clarity
117.	the second → a second	Determiner use (a/an/the/this, etc.)	Correctness
118.	of the	Wrong or missing prepositions	Correctness
119.	its → their	Pronoun use	Correctness
120.	important → essential, vital	Word choice	Engagement
121.	<i>every case should be treated</i>	Passive voice misuse	Clarity

122.	adequately treated, appropriately treated	Word choice	Engagement
123.	<i>On diagnosis, every case should be treated properly to lessen problems to the developing tooth buds and dentition.</i>	Unclear sentences	Clarity
124.	to diagnose	Wordy sentences	Clarity
125.	to	Wordy sentences	Clarity
126.	, and	Comma misuse within clauses	Correctness
127.	<i>invaginatus</i>	Unknown words	Correctness
128.	the treated	Determiner use (a/an/the/this, etc.)	Correctness
129.	ease → patient	Word choice	Engagement
130.	mesiodentes → residents	Misspelled words	Correctness
131.	<i>invaginatus</i>	Unknown words	Correctness
132.	mesiodentes → mesiodens	Misspelled words	Correctness
133.	mesiodentes → residents, mesiodens	Misspelled words	Correctness
134.	, and	Comma misuse within clauses	Correctness
135.	<i>Garvey MT, Barry HJ, Blake M. Supernumerary teeth – An overview of classification, diagnosis and management.</i>	Incomplete sentences	Correctness
136.	Decision-making → Decision-making	Misspelled words	Correctness
137.	mesiodentes → residents, mesiodens	Misspelled words	Correctness
138.	<i>Clinical characteristics and</i>	Incomplete sentences	Correctness

complications associated with mesiodentes.

139.	<i>Introduction A supernumerary tooth is a developmental anomaly of number characterized by the presence of tooth, in addition to the normal</i>	Mesiodens: A clinical and radiographic study in children ... https://www.jisppd.com/article.asp?issn=0970-4388;year=2011;volume=29;issue=1;spage=34;epage=38;aulast=Mukhopadhyay	Originality
140.	<i>The prevalence varies between 0.3% and 3.8% of the population. This anomaly of unknown etiology is more found in permanent dentition and in boys. Supernumerary teeth may occur as a single isolated anomaly or in association with specific developmental syndromes such as cleft lip and palate, down syn...</i>	Impacted mesiodentes with an inverted one: A rare case ... https://www.ijpedor.org/article.asp?issn=2468-8932;year=2018;volume=3;issue=2;spage=72;epage=75;aulast=Jose	Originality
141.	<i>Mesiodens can occur individually or as multiples called as mesiodentes.</i>	Mesiodens: A Case Report and Literature Review https://lupinepublishers.com/pediatric-dentistry-journal/pdf/IPDOAJ.MS.ID.000113.pdf	Originality
142.	<i>When they are inverted, the chances of eruption into the oral cavity are very</i>	Impacted mesiodentes with an inverted one: A rare case ... https://www.ijpedor.org/article.asp?issn=2468-8932;year=2018;volume=3;issue=2;spage=72;epage=75;aulast=Jose	Originality
143.	<i>offshoot from continued activity of the dental lamina after the normal number of tooth buds are formed, and atavism. Genetics and consanguineous marriages are also considered as etiological factors.</i>	Impacted mesiodentes with an inverted one: A rare case ... https://www.ijpedor.org/article.asp?issn=2468-8932;year=2018;volume=3;issue=2;spage=72;epage=75;aulast=Jose	Originality
144.	<i>may be discovered during radiological examination of the premaxillary area</i>	Mesiodens: A clinical and radiographic study in children ...	Originality

<https://www.jisppd.com/article.asp?issn=0970-4388;year=2011;volume=29;issue=1;spage=34;epage=38;aulast=Mukhopadhyay>

- | | | | |
|------|---|---|-------------|
| 145. | <i>Mesiodens may give rise to a variety of complications such as impaction, delayed eruption, ectopic eruption of adjacent teeth, crowding, malalignment of incisors, midline diastema, displacement and axial rotation of adjacent teeth, dilacerations, radicular resorption of adjacent teeth, possible dev...</i> | Impacted mesiodentes with an inverted one: A rare case ...
https://www.ijpedor.org/article.asp?issn=2468-8932;year=2018;volume=3;issue=2;spage=72;epage=75;aulast=Jose | Originality |
| 146. | <i>teeth. There was no associated history of trauma and pain. Medical</i> | Impacted mesiodentes with an inverted one: A rare case ...
https://www.ijpedor.org/article.asp?issn=2468-8932;year=2018;volume=3;issue=2;spage=72;epage=75;aulast=Jose | Originality |
| 147. | <i>was noncontributory. There were no signs of any syndrome. On intraoral examination, it was observed that 21 was erupted</i> | Impacted mesiodentes with an inverted one: A rare case ...
https://www.ijpedor.org/article.asp?issn=2468-8932;year=2018;volume=3;issue=2;spage=72;epage=75;aulast=Jose | Originality |
| 148. | <i>Blood investigations were done, and the reports were</i> | Impacted mesiodentes with an inverted one: A rare case ...
https://www.ijpedor.org/article.asp?issn=2468-8932;year=2018;volume=3;issue=2;spage=72;epage=75;aulast=Jose | Originality |
| 149. | <i>The palatal flap was placed back, and interrupted sutures were placed</i> | Impacted mesiodentes with an inverted one: A rare case ...
https://www.ijpedor.org/article.asp?issn=2468-8932;year=2018;volume=3;issue=2;spage=72;epage=75;aulast=Jose | Originality |

150.	<i>Following the removal of sutures 1 week later, the patient was scheduled for monthly recalls. The wound healing was uneventful, and the patient presented with no postoperative complications.</i>	Impacted mesiodentes with an inverted one: A rare case ... https://www.ijpedor.org/article.asp?issn=2468-8932;year=2018;volume=3;issue=2;spage=72;epage=75;aualast=Jose	Originality
151.	<i>Discussion The term of mesiodens is used to refer to an unerupted supernumerary tooth in the midline of maxilla between the central incisors.</i>	Impacted mesiodentes with an inverted one: A rare case ... https://www.ijpedor.org/article.asp?issn=2468-8932;year=2018;volume=3;issue=2;spage=72;epage=75;aualast=Jose	Originality
152.	<i>is defined as an extra tooth along with normal teeth with the prevalence of 0.15%–1.9</i>	Impacted mesiodentes with an inverted one: A rare case ... https://www.ijpedor.org/article.asp?issn=2468-8932;year=2018;volume=3;issue=2;spage=72;epage=75;aualast=Jose	Originality
153.	<i>78.1% of the cases and two in 21.9% of the cases. Most of the mesiodentes (55.2%) were found to be in a vertical position (55.2%) followed by inverted position (37.6%) and horizontal position</i>	ABSTRACT KEYWORDS https://www.worldwidejournals.com/indian-journal-of-applied-research-(IJAR)/recent_issues_pdf/2019/October/an-inverted-impacted-mesiodens-a-case-report_October_2019_1571897083_3508596.pdf	Originality
154.	<i>Most of the mesiodens remain unerupted, and if they are erupting, it will be an ectopic eruption.</i>	Mesiodens: A Case Report and Literature Review https://lupinepublishers.com/pediatric-dentistry-journal/pdf/IPDOAJ.MS.ID.000113.pdf	Originality
155.	<i>The maximum incidence of mesiodens reported between 7 and 9 years of age. This observation may be due to the fact that maxillary permanent central incisors erupt at this age. Radiological examination of</i>	Impacted mesiodentes with an inverted one: A rare case ... https://www.ijpedor.org/article.asp?issn=2468-8932;year=2018;volume=3;issue	Originality

	<i>noneruption or axial rotation of the upper central incisors or diastema might reveal the presenc...</i>	=2;spage=72;epage=75;aulast=Jose	
156.	<i>If the mesiodentes remains asymptomatic, the supernumerary teeth are left in place or the extraction is delayed until root formation of the adjacent teeth is completed.</i>	Impacted mesiodentes with an inverted one: A rare case ... https://www.ijpedor.org/article.asp?issn=2468-8932;year=2018;volume=3;issue=2;spage=72;epage=75;aulast=Jose	Originality
157.	<i>and see the behavior is indicated, while mesiodens extraction is discouraged due to the risk of iatrogenic damage to the permanent teeth or due to the risk of affecting the vitality of the permanent teeth.</i>	Impacted mesiodentes with an inverted one: A rare case ... https://www.ijpedor.org/article.asp?issn=2468-8932;year=2018;volume=3;issue=2;spage=72;epage=75;aulast=Jose	Originality
158.	<i>In addition, early surgical intervention in a young child requires the treatment under general anesthesia with complication risks, and it might create psychological, dental anxiety.</i>	Impacted mesiodentes with an inverted one: A rare case ... https://www.ijpedor.org/article.asp?issn=2468-8932;year=2018;volume=3;issue=2;spage=72;epage=75;aulast=Jose	Originality
159.	<i>Supernumerary teeth may remain in the jaw for years without any complications; however, they should be observed periodically as they may as well cause cystic complications (in about 4%–9% of cases), development of a carcinoma As long as the coronal part of the follicle of the supernumerary teeth re...</i>	Impacted mesiodentes with an inverted one: A rare case ... https://www.ijpedor.org/article.asp?issn=2468-8932;year=2018;volume=3;issue=2;spage=72;epage=75;aulast=Jose	Originality
160.	<i>Due to these ongoing and future complications, the impacted mesiodens were indicated for extraction. Nevertheless, the extraction that has been done at the right time, in this case, can prevent the complications. Fortunately, the postsurgical phase was uneventful in this surgical intervention.</i>	Impacted mesiodentes with an inverted one: A rare case ... https://www.ijpedor.org/article.asp?issn=2468-8932;year=2018;volume=3;issue=2;spage=72;epage=75;aulast=Jose	Originality

161.	<i>During the surgical removal of impacted supernumerary teeth in the maxillary anterior region, complications or disturbances to adjacent teeth with incomplete root development compared to the surgery postponed for complete root development of incisors has not been reported. Early intervention and su...</i>	Impacted mesiodentes with an inverted one: A rare case ... https://www.ijpedor.org/article.asp?issn=2468-8932;year=2018;volume=3;issue=2;spage=72;epage=75;aui=Jo	Originality
162.	<i>The spontaneous eruption of impacted maxillary incisors after removal of the supernumerary teeth depends on the several factors such as the depth of the impacted tooth, amount of root development, the angulation of the impacted tooth, and the available space required for its eruption. Therefore, im...</i>	Impacted mesiodentes with an inverted one: A rare case ... https://www.ijpedor.org/article.asp?issn=2468-8932;year=2018;volume=3;issue=2;spage=72;epage=75;aui=Jo	Originality
163.	<i>Thus, avoid the need for the second surgery. Moreover, it has been suggested that early exposure and bonding the unerupted incisor may result in loss of supporting bone and create scar tissue, which may further delay its</i>	Impacted mesiodentes with an inverted one: A rare case ... https://www.ijpedor.org/article.asp?issn=2468-8932;year=2018;volume=3;issue=2;spage=72;epage=75;aui=Jo	Originality
164.	<i>Conclusion Supernumerary teeth are of huge concern to both dentist and patient because of its potential problems and complications. Radiographic evaluation of erupted supernumerary teeth is important in the accidental detection of unerupted mesiodens. On diagnosis, every case should be treated prop...</i>	Management of Palatally Positioned Impacted Mesiodens: 2 ... https://orthodontics-endodontics.imedpub.com/management-of-palatally-positioned-impacted-mesiodens-2-case-reports.php?aid=18840	Originality
165.	<i>Once surgical removal of mesiodens is advised, long-term follow-up of treated case is required. References</i>	Management of Palatally Positioned Impacted Mesiodens: 2 ... https://orthodontics-endodontics.imedpub.com/management-of-palatally-positioned-impacted-mesiodens-2-case-reports.php?aid=18840	Originality

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|-------|---|---|-------------|
| 166. | <i>Impacted mesiodentes with an inverted one: A rare case report and literature review. Int J Pedod Rehabil</i> 2018;3:72-5. | Impacted mesiodentes with an inverted one: A rare case ...
https://www.ijpedor.org/article.asp?issn=2468-8932;year=2018;volume=3;issue=2;spage=72;epage=75;aulast=Jose | Originality |
| <hr/> | | | |
| 167. | <i>Canoglu E, Er N, Cehreli ZC. Double inverted mesiodentes: Report of an unusual case. Eur J Dent</i> 2009;3:219-23. <i>Desai VD, Baghla P, Sharma R, Gaurav I. Inverted impacted mesiodents: A case series. J Adv Med Dent Scie</i> 2014;2:135-40. <i>Sarne O, Shapira Y, Blumer S, Finkelstein T, Schonberger S, Bechor N...</i> | Impacted mesiodentes with an inverted one: A rare case ...
https://www.ijpedor.org/article.asp?issn=2468-8932;year=2018;volume=3;issue=2;spage=72;epage=75;aulast=Jose | Originality |

Main Document

by MIDSR Dental

General metrics

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913

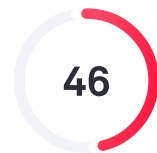
words

52

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time

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102

Issues left

54

Critical

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Plagiarism

**16**

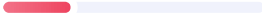







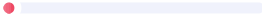

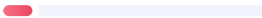









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sources

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Writing Issues

79	Correctness	
7	Misspelled words	
2	Text inconsistencies	
14	Comma misuse within clauses	
27	Determiner use (a/an/the/this, etc.)	
1	Improper formatting	
1	Wrong or missing prepositions	
4	Confused words	
15	Punctuation in compound/complex sentences	
1	Mixed dialects of english	
1	Pronoun use	
3	Unknown words	
1	Incomplete sentences	
1	Incorrect verb forms	
1	Faulty subject-verb agreement	
17	Clarity	
6	Wordy sentences	
3	Hard-to-read text	
3	Unclear sentences	
2	Intricate text	
3	Passive voice misuse	
6	Engagement	
6	Word choice	

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Measures average word length

5.1characters per word

Sentence Length

Measures average sentence length

17.6words per sentence

Main Document

Clinical Innovation

Title: The Unified denovo AP orthodontic diagnostic device.

Abstract:

Cephalometric analysis is a preferred tool in orthodontic diagnosis and treatment planning and in orthognathic surgical cases. A cephalometric tracing can be prepared and analyzed manually or by a computer using cephalometric tracing software. In manual cephalometric tracing we require multiple tools at a single time like protractor, Ruler, Divider, Set-squares etc. which is time consuming, cumbersome and sometimes compromises accuracy also. As we always face difficulties to measure the angular measurements in between two planes such as SN plane- mandibular plane, FH plane- MP, occlusal plane-FH plane etc., so fabrication of The Unified denovo AP orthodontic diagnostic device will make ease for angular and linear measurement. This can also be a quick and effective method for those clinicians and students who choose to diagnose orthodontic patients.

Keywords: orthodontic diagnostic device, cephalometrics, orthodontic diagnosis.

Introduction:

The introduction of cephalometry by Broadbent and Hofrath in the 1930s, the cephalometric technique has been regarded as a most important tool for orthodontists and maxillo-facial surgeons engaged in studying dental malocclusions and the underlying skeletal discrepancies. Applications for cephalometric analysis include case diagnosis, treatment planning, prediction of growth and the evaluation of treatment results. Manual tracing of

cephalometric Alms is performed by identifying radio-graphic landmarks on acetate overlays and using these reference points to construct lines, planes and angles to enable the measurement of linear and angular values, using a milli-meter scale and a protractor.¹ However, in many instances, this process of manual cephalometric tracing can be discouraging as it is time-consuming and cumbersome and in certain instances may require additional personnel.²

104 The aim of cephalometric analysis is to evaluate the relationships, both horizontally & vertically i.e to estimate the relationships, vertically & horizontally of the jaws to the cranial base & to each other & the relationship of the teeth to their surrounding bone.³

The Unified denovo AP orthodontic diagnostic device is a device that can be easily fabricated and used on a cephalogram/ Cephalometric tracing acetate sheet without carrying multiple geometric box tools to analyse and measure the cephalometric planes and angles. This can also be a quick and effective method for those clinicians who choose to diagnose orthodontic patients clinically. Hence, this device provides accuracy and reliability both.

Fabrication:

Armamentarium required:

A simple geometric protractor, Short Metal scale (15cm l), an iron metal rod ((15cm l), 0.019 x 0.025 stainless steel straight wire, neodymium iron boron (NdFeB) magnet 2 cm l and 2mm thick, DPI-RR Cold cure acrylic, Plunger flange of disposable plastic syringe, cyanoacrylate adhesive (fevikwik) [Fig 2].

Steps of fabrication:

The The Unified denovo AP orthodontic diagnostic device is composed of 2 components i.e one is Scale with protractor and one is adjustable magnetic reference plane[Fig.3].

A metal iron rectangular rod with dimensions of 15 cm length x 1cm breadth x 1cm width [Fig. 2]

Then a short metal scale with 15 cm length trimmed vertically into half with centimeter caliber visible and attached to top side of the metal iron rod with cyanoacrylate adhesive (fevikwik) [Fig.3]

Neodymium iron boron (NdFeB) magnet 2 cm length and 2mm thick was taken and acrylic block of 2 x 1 cm was made onto the magnet and kept one surface

105 | of magnet free of acrylic which was placed onto the side of metal iron rod to slide over it. However, it is important to ensure that the acrylic does not come in contact with the one side of magnet as it will prevent free movement. A handle was made with plunger flange portion of plastic syringe by cutting it into 1 cm and immediately placed into the acrylic block and then 0.019 x 0.025 stainless steel straight wire was cut into 11 cm length and inserted into the acrylic block above the 2 mm from bottom of metal rod [Fig.3].

Simple geometric protractor then attached to the bottom of metal iron rod with fevikwik

Use and Advantages

106 | The device can be placed directly on the Lateral cephalogram suitable points for deriving the necessary angular and linear measurements that are most commonly required by a clinician and students for diagnosis and treatment planning. So, Single device for accurate angular and linear measurements in cephalometric analysis.

The S.S wire is placed on respective plane for eg . SN plane, FH plane, Occlusal plane and Centre of protractor (900) placed on point of intersection on mandibular plane [Fig 4]

The acrylic block can be kept aside and only protractor with scale can be used to measure all the angles and no need to carry the whole geometry box [Fig 4].

It can be used at the time of clinical examination of patient [Fig 5] to measure the Facial proportions i.e total facial height, mid face height and lower face height accurately and facial width will give the accuracy about facial symmetry also [Fig 5].

On patient's cast, Overjet and Overbite can be measured with scale attached on metal rod.

Easy to carry i.e portable and transportable.

Easy to fabricate

Requires less time to fabricate

Convenient to measure all the angles on cephalometric tracing

Inexpensive and cost-effective.

Financial support and sponsorship:

Nil.

Conflicts of interest:

There are no conflicts of interest.

REFERENCES:

Hlongwa P. Cephalometric analysis: manual tracing of a lateral cephalogram.

South African Dental Journal. 2019 Jul;74(6):318-22.

107 | Albarakati SF, Kula KS, Ghoneima AA. The reliability and reproducibility of cephalometric measurements: A comparison of conventional and digital methods. Dentomaxillofac Radiol 2012;41:11-7.

Radiographic Cephalometry by Alexander Jacobson

1.	lenovo → Lenovo	Misspelled words	Correctness
2.	AP; SN; FH; MP; S.S	Text inconsistencies	Correctness
3.	in	Wordy sentences	Clarity
4.	<i>A cephalometric tracing can be prepared and analyzed manually or by a computer using cephalometric tracing software.</i>	Hard-to-read text	Clarity
5.	tracing,	Comma misuse within clauses	Correctness
6.	tracing → drawing	Word choice	Engagement
7.	a protractor	Determiner use (a/an/the/this, etc.)	Correctness
8.	, etc.	Comma misuse within clauses	Correctness
9.	time-consuming → time-consuming	Misspelled words	Correctness
10.	, and	Comma misuse within clauses	Correctness
11.	<i>In manual cephalometric tracing we require multiple tools at a single time like protractor, Ruler, Divider, Set-squares etc. which is time consuming, cumbersome and sometimes compromises accuracy also.</i>	Unclear sentences	Clarity
12.	always → continually	Word choice	Engagement
13.	, etc.	Comma misuse within clauses	Correctness
14.	lenovo → Lenovo	Misspelled words	Correctness
15.	linear measurement	Improper formatting	Correctness
16.	<i>As we always face difficulties to measure the angular measurements</i>	Unclear sentences	Clarity

in between two planes such as SN plane- mandibular plane, FH plane- MP, occlusal plane-FH plane etc., so fabrication of The Unified denovo AP orthodontic diagnostic device will make ease for angular and linear measurement.

17.	<i>This can</i>	Intricate text	Clarity
18.	With the	Wrong or missing prepositions	Correctness
19.	a most → the most	Determiner use (a/an/the/this, etc.)	Correctness
20.	important → essential, critical	Word choice	Engagement
21.	maxillo-facial → maxillofacial	Confused words	Correctness
22.	and	Wordy sentences	Clarity
23.	, and	Comma misuse within clauses	Correctness
24.	<i>Applications for cephalometric analysis include case diagnosis, treatment planning, prediction of growth and the evaluation of treatment results.</i>	Unclear sentences	Clarity
25.	radio-graphic → radiographic	Confused words	Correctness
26.	, and	Comma misuse within clauses	Correctness
27.	measure	Wordy sentences	Clarity
28.	milli-meter → millimeter	Confused words	Correctness
29.	, in	Punctuation in compound/complex sentences	Correctness
30.	instances,	Punctuation in compound/complex sentences	Correctness
31.	the cephalometric	Determiner use (a/an/the/this, etc.)	Correctness

		etc.)	
32.	cephalometric analysis aims	Wordy sentences	Clarity
33.	i.e → i.e.	Comma misuse within clauses	Correctness
34.	, i.e	Punctuation in compound/complex sentences	Correctness
35.	te	Wordy sentences	Clarity
36.	the relationship	Determiner use (a/an/the/this, etc.)	Correctness
37.	denovo → Lenovo	Misspelled words	Correctness
38.	analyse → analyze	Mixed dialects of English	Correctness
39.	<i>The Unified denovo AP orthodontic diagnostic device is a device that can be easily fabricated and used on a cephalogram/ Cephalometric tracing acetate sheet without carrying multiple geometric box tools to analyse and measure the cephalometric planes and angles.</i>	Hard-to-read text	Clarity
40.	<i>This can</i>	Intricate text	Clarity
41.	both	Pronoun use	Correctness
42.	the disposable, or a disposable	Determiner use (a/an/the/this, etc.)	Correctness
43.	fevikwik	Unknown words	Correctness
44.	<i>A simple geometric protractor, Short Metal scale (15cm l), an iron metal rod ((15cm l), 0.019 x 0.025 stainless steel straight wire, neodymium iron boron (NdFeB) magnet 2 cm l and 2mm thick, DPI-RR Cold cure acrylic, Plunger flange of disposable plastic</i>	Incomplete sentences	Correctness

syringe, cyanoacrylate adhesive
(fevikwik) [F...

45.	The Unified	Misspelled words	Correctness
46.	lenovo → Lenovo	Misspelled words	Correctness
47.	i.e → i.e.	Comma misuse within clauses	Correctness
48.	, i.e	Punctuation in compound/complex sentences	Correctness
49.	, one	Punctuation in compound/complex sentences	Correctness
50.	Scale; scale	Text inconsistencies	Correctness
51.	a protractor	Determiner use (a/an/the/this, etc.)	Correctness
52.	, and	Punctuation in compound/complex sentences	Correctness
53.	one is	Wordy sentences	Clarity
54.	an adjustable	Determiner use (a/an/the/this, etc.)	Correctness
55.	is trimmed	Incorrect verb forms	Correctness
56.	the half	Determiner use (a/an/the/this, etc.)	Correctness
57.	the top	Determiner use (a/an/the/this, etc.)	Correctness
58.	fevikwik	Unknown words	Correctness
59.	was → were	Faulty subject-verb agreement	Correctness
60.	, and	Punctuation in compound/complex sentences	Correctness

61.	magnet → interest	Word choice	Engagement
62.	was placed	Passive voice misuse	Clarity
63.	the metal	Determiner use (a/an/the/this, etc.)	Correctness
64.	important → essential, vital, crucial	Word choice	Engagement
65.	the one	Determiner use (a/an/the/this, etc.)	Correctness
66.	the magnet, or a magnet	Determiner use (a/an/the/this, etc.)	Correctness
67.	a plunger	Determiner use (a/an/the/this, etc.)	Correctness
68.	the plastic, or a plastic	Determiner use (a/an/the/this, etc.)	Correctness
69.	and then → . Then	Hard-to-read text	Clarity
70.	the bottom	Determiner use (a/an/the/this, etc.)	Correctness
71.	the metal	Determiner use (a/an/the/this, etc.)	Correctness
72.	fevikwik	Unknown words	Correctness
73.	<i>The device can be placed directly on the Lateral cephalogram suitable points for deriving the necessary angular and linear measurements that are most commonly required by a clinician and students for diagnosis and treatment planning.</i>	Passive voice misuse	Clarity
74.	a Single	Determiner use (a/an/the/this, etc.)	Correctness
75.	a respective, or the respective	Determiner use (a/an/the/this, etc.)	Correctness

76.	, eg	Comma misuse within clauses	Correctness
77.	eg. → e.g.	Comma misuse within clauses	Correctness
78.	, and	Comma misuse within clauses	Correctness
79.	the protractor	Determiner use (a/an/the/this, etc.)	Correctness
80.	placed → put	Word choice	Engagement
81.	on point of → on the point of	Determiner use (a/an/the/this, etc.)	Correctness
82.	the mandibular, or a mandibular	Determiner use (a/an/the/this, etc.)	Correctness
83.	, and	Punctuation in compound/complex sentences	Correctness
84.	the only	Determiner use (a/an/the/this, etc.)	Correctness
85.	a protractor	Determiner use (a/an/the/this, etc.)	Correctness
86.	<i>only protractor with scale can be used</i>	Passive voice misuse	Clarity
87.	, and	Punctuation in compound/complex sentences	Correctness
88.	the patient	Determiner use (a/an/the/this, etc.)	Correctness
89.	i.e. → i.e.	Comma misuse within clauses	Correctness
90.	, i.e	Punctuation in compound/complex sentences	Correctness
91.	, total	Punctuation in compound/complex sentences	Correctness

92.	mid-face → midface	Confused words	Correctness
93.	, and	Comma misuse within clauses	Correctness
94.	, accurately	Punctuation in compound/complex sentences	Correctness
95.	, and	Punctuation in compound/complex sentences	Correctness
96.	the patient's	Determiner use (a/an/the/this, etc.)	Correctness
97.	a scale	Determiner use (a/an/the/this, etc.)	Correctness
98.	a metal, or the metal	Determiner use (a/an/the/this, etc.)	Correctness
99.	i.e → i.e.	Comma misuse within clauses	Correctness
100.	, i.e	Punctuation in compound/complex sentences	Correctness
101.	, portable	Punctuation in compound/complex sentences	Correctness
102.	costEffective → cost-effective	Misspelled words	Correctness
103.	<i>The introduction of cephalometry by Broadbent and Hofrath in the 1930s, the cephalometric technique has been regarded as a most important tool for orthodontists and maxillo-facial surgeons engaged in studying dental malocclusions and the underlying skeletal discrepancies. Applications for cephalome...</i>	Cephalometric analysis: manual tracing of a lateral ... http://www.scielo.org/za/scielo.php?script=sci_arttext&pid=S0011-85162019000600009	Originality
104.	<i>i.e to estimate the relationships, vertically & horizontally of the jaws to the cranial base & to each other & the relationship of the teeth to their surrounding bone.</i>	Cosmetic Dentist – Smile Makeovers Smile Design & Facial ... https://naturaldentistrycenter.com/cosmetic-dentistry/facial-	Originality

[esthetics-smile/](#)

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|------|---|---|-------------|
| 105. | <i>However, it is important to ensure that the</i> | However it is important to ensure that the boards function ...
https://www.coursehero.com/file/pg0ahts/However-it-is-important-to-ensure-that-the-boards-function-efficiently-for-if/ | Originality |
| 106. | <i>The device can be placed directly on the</i> | Sony Patents Incredibly Small Contact Lens Camera
https://interestingengineering.com/sony-patents-incredibly-small-contact-lens-camera | Originality |
| 107. | <i>The reliability and reproducibility of cephalometric measurements: A comparison of conventional and digital methods.</i> | The reliability and reproducibility of cephalometric ...
https://www.birpublications.org/doi/abs/10.1259/dmfr/37010910 | Originality |

Dr Om Asplenic Patient Case Report

by MIDSr Dental

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33,871	4,665	588	18 min 39 sec	35 min 53 sec
characters	words	sentences	reading time	speaking time

Score



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Writing Issues

387	217	170
Issues left	Critical	Advanced

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Writing Issues

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Correctness

4	Text inconsistencies	
31	Punctuation in compound/complex sentences	
16	Unknown words	
38	Determiner use (a/an/the/this, etc.)	
22	Comma misuse within clauses	
52	Improper formatting	
64	Misspelled words	
16	Mixed dialects of english	
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1	Pronoun use	
2	Incorrect noun number	
8	Confused words	
6	Closing punctuation	
1	Incomplete sentences	
4	Incorrect verb forms	
2	Faulty subject-verb agreement	
1	Faulty tense sequence	
1	Faulty parallelism	
1	Misplaced words or phrases	
1	Misuse of semicolons, quotation marks, etc.	

81

Clarity


32	Passive voice misuse	
27	Wordy sentences	
19	Intricate text	

3 Hard-to-read text 

31 **Engagement**

31 Word choice 

3 **Delivery**

3 Inappropriate colloquialisms 

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Sentence Length

7.9

Measures average sentence length

words per sentence

Dr Om Asplenic Patient Case Report

19

(Dr. Om Baghele. Perio. Pre-final draft)

DENTAL SURGERY IN AN ASPLENIC PATIENT – A CASE REPORT

ABSTRACT

388 | Nonsurgical¹ endodontic treatment is a highly predictable treatment option in most cases but² surgery³ may be indicated⁴ for teeth with persistent periradicular⁵ pathosis unresponsive to it⁶. The persistence of infection usually, but not always, indicates⁷ reduced immunological resistance. In such scenario^{8,9} the clinician should be vigilant and find out the source before implementing treatment. Following splenectomy¹⁰, individuals have an elevated risk of infection¹¹, in particular to encapsulated bacteria¹², Gram-negative pathogens¹³ such as Capnocytophaga¹⁴ carnimorsus¹⁵ and Bordetella holmesii¹⁶, and intra-erythrocyte parasites¹⁷ such as Malaria¹⁸ and Babesia¹⁹. After splenectomy²⁰, there are alterations in cell counts, cell quality, and immunological responses. Initially after splenectomy²¹, a reactive thrombocytosis and leukocytosis²² observed. Splenectomised²³ individuals are at risk to²⁴, overwhelming bacterial sepsis (OPSI). The complications²⁵ are now infrequent because of pneumococcal vaccinations, prophylactic penicillin, and prompt medical attention at the first sign of fever. This case presents a management of a periradicular lesion in 32²⁶ year old male who has undergone splenectomy²⁷ because of idiopathic thrombocytopenic purpura (ITP)²⁸. The tooth was first endodontically treated that²⁹ was followed by periodontal surgical treatment^{30,31}.

Keywords: persistent periapical infection, endodontic treatment, dental management, periodontal surgery, splenectomy, idiopathic thrombocytic purpura, periapical surgery, asplenic patient.

INTRODUCTION

A majority of periapical lesions develop as sequelae to pulpal disease. An array of microorganisms from the pulp tissue may lead to tractable or intractable dento-salveolar infections. They are generally diagnosed either during radiographic examination or following acute dental pain or when they become symptomatic. Most periapical lesions can be classified as radicular cyst, abscesses or periapical granulomas. For such lesions root canal therapy (RCT) is one of the most successful and established treatment. But still 9.7.% of these treatments can fail because of various reasons.¹

³⁸⁹ After the failure of the conventional root canal treatment, nonsurgical retreatment is the preferred option in most cases. Several factors, such as complex root canal system or previous procedural accidents or traumatic injuries may impede the success of non surgical retreatment. In these cases, periapical surgeries would be the treatment of choice to preserve the tooth. These periapicalsurgery belongs to the field of endodontic surgery, which also includes incision and drainage, closure of perforations, and root or tooth resections.² This periapical surgery can be performed by endodontist, periodontist and oral maxillofacial surgeon, or even a General Dental Practitioner (GDP), with appropriate skill sets and expertise. Periapical surgery or an apicoectomy was well defined in 1884 by J. Farrar as "a bold act, which removes the entire cause [of disease] and which will lead to a permanent cure may not be the best in the end, but the most human."³ The objective of apical surgery is to surgically maintain a tooth that primarily has an endodontic lesion

391 that cannot be resolved by conventional endodontic treatment or
 (re-)treatment.^{2,4} Performing root end resection and preparation,⁵⁹ the root canal⁶⁰
 filling is placed within the created cavity to close the path of communication
 between infected root canal system and peri-radicular tissues.

Indications for apical surgery³ have been recently updated by the ESE (European
 Society of Endodontology, 2006)⁵ and include the following:

- 392 (1) Radiological findings of apical periodontitis and/or⁶¹ symptoms associated
 with an obstructed canal (the obstruction proved not to be removable,
 displacement did not seem feasible or⁶² the risk of damage was too great).⁶³
 (2) Extruded material with clinical or radiological findings of apical periodontitis
and/or⁶⁴ symptoms continuing over a prolonged period.
 (3) Persisting or emerging disease following root-canal treatment when root
 393 canal re-treatment⁴⁸ is inappropriate.
 (4) Perforation of the root or the floor of the pulp chamber and where it is
impossible to treat from within the pulp cavity.⁶⁵

394 Contraindications for apical surgery³ include the following: the tooth has no
function (no antagonist, no strategic importance serving as a pillar for a fixed
 395 prosthesis), the tooth cannot be restored, the tooth has inadequate periodontal
support, or the tooth has a vertical root fracture.⁶⁶ Additional general contra-⁶⁷
indications⁶⁸ may be an uncooperative patient or a patient with a compromised
 69,70 medical history for an oral surgical intervention⁶

In endodontically treated horizontal root fractures⁷¹ in which there are symptoms⁷²
 of apical fragments involved, the most indicated treatment is surgical removal⁷³
 of the coronary fragment⁷ Another indication for apical surgery³ is when wide⁷⁴
 radiopaque periapical lesions of over 8-10 millimetres⁷⁵ in diameter exist.
 These lesions may thereby be removed,⁷⁶ and histological examination may be
 77 performed⁷⁷ to prevent malignant lesions from going undiagnosed⁸

396 Patients who have undergone splenectomy ¹¹ are known to have ⁷⁸ an increased risk of overwhelming infection with an overall mortality rate of 2.5 percent.^{9,10} Dental practitioners are urged ⁷⁹ to consult with the patient's physician regarding the patient's overall ⁸⁰ medical status. ⁸¹ Risk ⁸² of infection and sepsis is only one concern in the asplenic patient. The dental practitioner also must examine the reason for asplenia and correlate dental therapy with the medical condition of the patient. ⁸³

The spleen is a fist-sized spongy organ situated in the upper left abdomen, behind the lower ribs, that comprises approximately 25percent of the body's lymphoid tissue.^(fig.1) ⁸⁴ It ⁸⁵ consists of a white ⁸⁶ pulp, a red pulp ⁸⁷ and a surrounding fibrous capsule. ⁸⁸ The white pulp ⁸⁹ derives its appearance from the presence of white blood cells, particularly lymphocytes, that accumulate in the periarterial lymphatic sheaths and follicles. ⁹⁰ The red pulp ⁹¹ derives its appearance from the gathering of erythrocytes in the splenic sinus capsule. ⁹² ⁹³ 11(fig.2)

398 The spleen plays an important ⁹⁴ role in the body's defence ⁹⁵ mechanism against microbial infections. ⁹⁶ However, trauma or diseases sometimes make removal ⁹⁷ of this important ⁹⁸ organ necessary,which predisposes patients to certain infections. ⁹⁹ This increased risk of infection and the underlying reason for the organ's removal both may affect the provision of dental care. ¹⁰⁰ 11 Since the first deliberate removal of a diseased spleen by Quittenbaum 12 in 1826 ¹⁰⁰ splenectomy has become a well established surgical procedure.

399 Spleen function: Immunological function

The spleen can initiate immune responses to blood-borne antigens, produce antibodies, and clear antibody-mediated pathogens. The spleen ¹⁰¹ consists of cells involved in both innate and adaptive immunity. ¹⁰² Red pulp macrophages filter the blood and remove bacteria, damaged erythrocytes, and erythrocyte inclusions. Marginal zone macrophages remove cellular debris in the marginal

401

402 zone and tingible body macrophages((tingible body macrophage is a type of
 403 macrophage predominantly found in germinal ¹⁰³centres, containing many
 phagocytized, apoptotic cells in various states of degradation, referred to as
 tingible/ stainable bodies. They contain condensed chromatin fragments)
 404 remove B-cell debris in the germinal center of the follicle. In addition to
 macrophages, there are also dendritic cells, natural killer cells, and monocytes
 that are ¹⁰⁴involved in inducing T cell responses to pathogens.¹⁰⁵The white pulp of
 the spleen is B-cell dominant (follicles) with some T cell zones. Splenic B cells
 produced specific antibodies for immunity (affinity maturation) and to enhance
 cytotoxic T-cell activity.¹³

Hematological function

405 The spleen also sequesters blood cells ¹⁰⁶including platelets. The ¹⁰⁷spleen is
 thought ¹⁰⁸to pool approximately one-third of the total platelet volume in addition
¹⁰⁹to sequestration ¹¹⁰of erythrocytes and granulocytes. Tests of splenic function
evaluate the capacity of the spleen to remove intra-erythrocytic inclusions
such as Howell–Jolly bodies and erythrocyte pits, in addition to its ability to
maintain IgM memory B cell population.¹¹¹¹⁴

A spleenless existence ¹¹²was considered to be ¹¹³quite safe as the spleen was
 considered ¹¹⁴unnecessary for life until 1952 when King and Schumacher drew
 attention to the risk of overwhelming ¹¹⁵post splenectomy infection (OPSI).¹⁵As
 the ¹¹⁶spleen is responsible for making antibodies and removing bacteria, ¹¹⁷aged,
 antibody-coated and damaged blood cells, those without a spleen have an
 impaired immune system.^{16,17}Because of this, ¹¹⁸splenectomized patients have
 a more difficult time ¹¹⁹recovering from pneumonia, meningitis, ¹²⁰haemophilus
¹²¹influenzae (Hib) flu, sepsis, nosocomial infections, babesiosis (a tick-borne
 disease), malaria and other parasitic diseases and gram-negative bacterial
 diseases from animal bites.^{18,19,20}Although the liver can perform this

function in the absence of the spleen, higher levels of specific antibody ¹²² and an intact complement system are probably required.¹⁷ The changes in immune function that occur after splenectomy result in ¹²³ increased risk of infection and predispose patients to high-grade bacteraemias and overwhelming sepsis.

Absolute indications for splenectomy²¹

Splenic trauma Splenic rupture-Spontaneous (tropical splenomegaly),

Delayed rupture (subcapsular ¹²⁴ haematoma from trauma),

¹²⁵ Splenic abscess (e.g. ¹²⁶ tuberculous infection)

Splenic cysts,

Neoplasm, ¹²⁷ As part of radical surgical oncological clearance of adjacent ¹² tumour.

e.g. ¹²⁹ locally advanced gastric carcinoma, pancreatic carcinoma, Angioma,

Primary (rare), ¹³⁰ Aneurysm of ¹³¹ splenic artery

Complications of splenectomy-21

¹³² Haemorrhage,

Thromboembolic,

Subphrenic abscess,

Chest infection,

Acute

Short term

Long term

¹³³ Haemorrhage

During

Immediately

Overwhelming postoperative infection

Disseminated intravascular coagulation

OPSI/DIC

Pulmonary atelectasis and pneumonia

Pulmonary infection

Pulmonary infection

Sympathetic pleural effusion

Subphrenic abscess/cellulitis

Deep vein thrombosis

Venous thrombosis

Gastric ileus

Spleno¹³⁴-portal thrombosis(fever, abdominal complaints)

Pulmonary hypertension

Acute pancreatitis

Enhanced arteriosclerosis¹³⁵

Thrombocytosis and leucocytosis(peaks 7th-14th day)

Arterial thrombosis

Severe thrombosis

After splenectomy¹¹

Myeloproliferative disorders

Table no.1 complications of splenectomy¹¹

Prevention of overwhelming post splenectomy¹³⁶ infection (OPSI)22

Class

OPSI prophylaxis

Timing

<2 years

None (immature immune system)

>2 years

Immunization

At least 2 weeks before splenectomy¹¹ for optimal antibody response

Functional hyposplenism (e.g. sickle cell, ITP, coeliac disease)

Emergency splenectomy

Immunization

Following emergency splenectomy

Immunization effect not as good

Still better than not being given

Asplenic patients

Immunization

Add influenza vaccine (prophylaxis against secondary bacterial infection)¹³⁷

Splenectomy in underlying immunosuppressive disease (e.g. lymphoproliferative) or sickle cell disorder

Immunization

Life long prophylactic antibiotics

Monitor response to pneumococcal vaccination

Timing of revaccination determine by levels of protective antibody¹³⁸Splenectomy in patients on immune suppressing¹³⁹ therapies (chemotherapy and/or radiotherapy)¹⁴⁰

Immunization

Life long prophylactic antibiotics

Immunization delayed at least ¹⁴¹6 months following chemotherapy/radiotherapy ¹⁴

High risk ¹⁴³ patient (<18yrs, immunosuppressed)

Life long prophylactic antibiotics against pneumococcal infection(penicillins/macrolides)

Prompt systemic antibiotic treatment for infection

Regularly reviewed in light of local pneumococcal resistance patterns ¹⁴⁴

Low risk ¹⁴⁵ patients

Counselled ¹⁴⁶ on risks and benefits of life long ¹⁴⁷ antibiotics and choose to discontinue

Carry a supply of appropriate antibiotics for emergency

Antimalarial prophylaxis

Malaria belt

Treat malaria infection early and aggressively ¹⁴⁸

Table no 2. Summary of British haematology ¹⁴⁹ guidelines on timing and type of vaccinations in elective and emergency splenectomy.

The present case report describes a combination of endodontic therapy ¹⁵⁰ and periapical surgery ³ with use ¹⁵¹ of Biodentine in asplenic patient, ¹⁵³ to emphasize that a vigilant ¹⁵⁴ approach is required to deliver dental care appropriately and successfully for the patient.

CASE REPORT

A 32 year old ¹⁵⁵ male reported to the Department of Periodontics at Maharashtra institute of dental sciences, Latur ¹⁵⁶ with a chief complaint of pus discharge and ¹⁵⁷

pain in upper front region of jaw since last ¹⁵⁸ 2 weeks ^{159 160} .Medical history revealed ^{161,162 163} that he was diagnosed with idiopathic thrombocytopenic purpura (ITP) ten years ago after that he underwent splenectomy ¹¹ Acomplete haemogram was ¹⁶⁴ carried out ¹⁶⁵ and all the parameters found within normal limits. ¹⁶⁶

Complete haemogram

Sr.

No.

Name of the test

Observed values

(Normal values)

1

Red blood cells(RBC)

4.74X10⁶μL

5-5.5X10⁶ μL(male),

4.5X10⁶ μL(female)

2

White blood cells(WBC)

10.7X10³μL

4000-11000/μL

3

Haemoglobin (Hb) ¹⁶⁷

13.1gm%

13-15gm% for male

12- 14gm% female

4

Neutrophils

46%

40-75%

5

Basophils

00%

0-1%

6

Eosinophils

05%

0-6%

7

Lymphocytes

45%

20-40%

8

Monocytes

04%

0-8%

9

Platelet count

4,61,000/cumm

1.5-4.5lacs/cumm¹⁶⁸

10

Bleeding time(BT)

2 min 38 sec

2-6min

11

Clotting time (CT)

4 min 51sec

2-8 min

12

Prothrombin time (PT)

17 sec

11-13.5sec

13

CON

16 sec

15-30 sec

14

International normalized ration¹⁶⁹(INR)

1.1

1

15

Kidney function test Serum creatinine¹⁷⁰

1.12mg%

0.8-1.4mg%

16

Blood sugar ®

80mg/dl

70-140mg%

17

Liver function test

Total proteins

Albumin

Globulin

Total bilirubin

Direct bilirubin

SGOT

SGPT

ALK phosphatase

7.2gm%

4.2gm%

3.0gm%

0.51mg%

0.16mg%

28.5U/L

17.1U/L

10.3U/L

6.6-8.3gm/dl

3.5-5.0gm/dl

2.5-3.5gm/dl

0.20-1.00mg/dl

0.0-0.20mg/dl

UPTo 46U/L

UPTO 49U/L

60-170U/L

18

HbsAg Australia Antigen

Negative

19

HIV-I, HIV-II antibody

Negative

Table no.3 Complete Haemogram

There is no history of spontaneous bleeding and edema or any sign of ecchymosis in the recent past ¹⁷¹6 months. ¹⁷²Dental history revealed ^{173,174}traumatized the upper left front teeth and pus discharge from ¹⁷⁵labial aspect eighteen years ago. ¹⁷⁶Ellis class IV fracture. Endodontic treatment ¹⁷⁷was suggested ¹⁷⁸which consisted of apexification ¹⁷⁹for 21 due to incomplete root development seen on IOPA. ¹⁸⁰Accordingly endodontic treatment was performed with 21,22. ^{181,182}The patient was asymptomatic for 4 months, ¹⁸³after endodontic treatment, ¹⁸⁴until he reported to department of Endodontics with ¹⁸⁵complaints of ¹⁸⁶pus ¹⁸⁷discharge with 21. ¹⁸⁸The sinus tract ¹⁸⁹opening in relation to ¹⁹⁰the 21,22 after RCT. On performing sinus tracing, it revealed that sinus originated particularly with 21 (on the labial site). Intra-oral gingival examination showed ¹⁹¹reddish pink color with melanin pigmentation, ¹⁹²Gingival margins were scalloped.

Probing depth

3

2

1

1

2

3

Palatal

3

2

3

3

2

3

3

2

3

3

2

3

3

2

3

3

3

3

Labial

3

3

3

3

2

3

3

3

3

3

3

3

3

2

3

3

3

3

Mobility

I

|

Table no.4 Periodontal Examination w.r.t upper 13-23

Radiographic Examination:

Cone beam computer tomography (CBCT) of concern teeth reveal that well defined periapical abscess or infection.¹⁹³ (approx. dimensions 3X3mm)(fig.3)

Intraoral Periapical Radiograph (IOPA) showed well defined periapical radiolucency seen w.r.t 21,22. W.r.t 21 open apex seen.(fig.4)

Diagnosis:

The differential diagnosis included periapical abscess, granuloma¹⁹⁴ or radicular cyst secondary to necrosed¹⁹⁵ pulp because of accidental trauma.

The periodontal diagnosis according to 2017 Classification of Periodontal Diseases was put forth as "Generalized gingivitis- dental plaque induced on intact periodontium- mediated by systemic factor (splenectomised condition) with endo-periodontal lesion without root damage in a non-periodontitis patient- Grade 1."¹⁹⁹

Treatment Plan

Endodontic Management: Based on Diagnosis

The combined endodontic- periodontic lesions are best treated by first performing the necessary endodontic care followed by periodontal therapy,²⁰⁰ if required.²⁰¹ Still, the periodontal hygiene procedures are started first.²⁰² Pulp vitality tests were performed.²⁰³ Thermal tests and electrical pulp tester elicited a negative response when compared to control teeth.²⁰⁴ The²⁰⁵ clinical and radiological evaluation confirmed the maxillary left lateral incisor associated with

periapical pathology. Under rubber dam isolation, necrotic pulp ²⁰⁷ was removed ²⁰⁸ from root canals. Cleaning and shaping was achieved ²⁰⁹ using stainless steel K ²¹⁰ Files (fig.5) (Mani, Japan) by crown down technique to minimize the apical extrusion.

Irrigant used was 5.25% sodium hypochlorite and 17% EDTA (ethylene ²¹¹ diaminetetraacetic acid) ²¹² and saline ²¹³ was used ²¹⁴ in between two irrigants.. ²¹⁵ The canals were finally flushed with chlorhexidine and then repeated ²¹⁶ water based ²¹⁷ Ca(OH)₂ paste (fig.6) was given ²¹⁸ for approximately ²¹⁹ period ²²⁰ of one year. ²²¹ The tooth was asymptomatic and ²²² the periapical radiolucency ²²³ showed sign ²²⁴ of reduction ²²⁵ with 21.

Apexification done ²²⁴ with 21 using Bio-dentine ²²⁵ apical plug followed by final obturation done using thermoplastisized ²²⁶ Gutta Percha. ²²⁷ Post ²²⁸ obturation restoration done ²²⁹ using composite resin. The patient was re-examined ²³⁰ after two months for review ²³¹ then there was a sinus tract opening w.r.t 21 after tracing it with gutta percha ²³² point (fig.8) it was confirmed ²³³ that sinus opening associated with 21 and periapical radiolucency remained unchanged. Patient ^{234,235} was planned ²³⁶ for surgical intervention.

Periapical Management

The surgical procedure was performed ²³⁷ using infraorbital and nasopalatine nerve blocks and field blocks as necessary, by infusing lignocaine with 1:80000 adrenaline as local anaesthetic ²³⁸ (fig.9)(fig.10). Trapezoidal flap design ²³⁹ was ²⁴⁰ planned. ²⁴¹ Buccal full thickness ²⁴² mucoperiosteal flaps ²⁴³ were raised ²⁴⁴ extending from the maxillary right central incisor tooth to the maxillary left first premolar tooth, with a buccal vertical relieving incision at the maxillary left premolar tooth and at ²⁴⁵ maxillary right central incisor (fig.11),(fig.12).

After full thickness ²⁴⁵ flap reflection buccally, degranulation done in periapical ²⁴⁶ region of 21,22, then flushed with the normal saline (0.9%), followed by ²⁴⁷ a small

osteotomy produced²⁴⁸ to locate the root-end that was resected by about 3 mm (fig.13) (fig.14) The resection plane was slant or perpendicular(for avoiding the apical microleakage) to the long axis of the tooth. After this root end²⁴⁹ filling²⁵⁰ material was placed into the cavity preparation with Biodentine (fig.15) Before suturing a radiographic verification²⁵¹ made. Flap approximation and suturing²⁵² was done(continuous sling²⁵³ sutures)(fig.16).Post-operative radiograph taken(fig.17),after 8days follow up given (fig.18). patient reported²⁵⁴ for follow up after 1 month (fig.19) (fig.20).

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Discussion

After the failure of the conventional root canal treatment (RCT), non-surgical¹ retreatment⁴⁸ is the preferred option in most cases. Several factors, such as a complex root canal system or previous procedural accidents, may impede the success of non-surgical¹ retreatment^{48 255}. In these cases, periradicular²⁵⁶ surgery³ and apicoectomy would be the treatment of choice to preserve the tooth²⁴Periapical^{3,257} surgery²⁵⁸ is the last hope to save an endo-dontically³ treated tooth with a periapical lesion. The treatment outcome of apical³ surgery³ should be assessed²⁵⁹ clinically and radiographically.²⁶⁰ Only the combination of clinical and radiographic healing criteria is accepted today to determine the outcome of apical surgery²⁵ Clinical healing is based on the absence of signs and symptoms such as pain, sinus tract, swelling, apico-marginal²⁶¹ communication, and tenderness to palpation or percussion. Standard radiographic healing classes include complete healing, incomplete healing ("scar tissue formation"), uncertain healing (partial resolution of postsurgical radiolucency), and unsatisfactory healing (no change or an increase in postsurgical radiolucency). This classification is based²⁶² on landmark studies that have compared radiographic findings with histopathologic results of periapical tissues of teeth that had to be extracted²⁶³ after apical surgery.²⁶ Several studies

have also ²⁶⁴ compared the healing outcome of re-surgery and first-time surgery cases.²⁶⁵ For re-surgery cases, the healing outcome ²⁶⁶ was 7% to 27% lower than for first-time surgery cases. A recent 5-year longitudinal study found a ²⁶⁷ low success rate of 59% for re-surgeries ²⁶⁸ compared to a high success rate of 86% for first-time surgeries.²⁶⁹ Another important issue to consider in the healing outcome of apical surgery ³ is the difficulties and challenges of combined endo-perio ²⁷⁰ lesions, ²⁷¹ in particular the absence of the buccal bone plate with a completely exposed ²⁷² buccal root surface.

408 | Only a few clinical studies have compared the healing outcomes in apical surgery ³ of teeth with intact and ²⁷³ with missing buccal bone. Wesson and Gale (2003) determined the 5-year success rates associated with molar apical surgery ³ in consideration of the width of the buccal "bone cuff" ²⁷⁴ prior to wound closure.²⁷⁵ Teeth with a width of 3 mm or greater of cuff had a healing rate of 76%, whereas teeth with no buccal bone cuff had a significantly lower healing rate of 46% (p< 0.0001). Numerous materials have ²⁷⁶ been recommended for root end ²⁷⁷ obturation, and many studies have attempted to identify an ideal material;

409 | however, ²⁷⁸ an ideal material ²⁷⁹ has not been found³⁰

Dental considerations in asplenic ²⁸⁰ patient

410 | Patients who have undergone splenectomy ¹¹ are known to have an increased risk of overwhelming infection, with an overall mortality rate of 2.5 percent¹⁰ In the early 1980s, Terezhalmly and Hall supported the use of antimicrobial prophylaxis before performing dental procedures in these patients.³¹ Chaikof and McCabe reported that fatal sepsis ²⁸¹ can occur up to 30 years after splenectomy, ¹¹ Ellison and Fabri found that 20 percent of fatal sepsis cases ²⁸² occurred in the first six months and 60 percent occurred within two years.³² It ²⁸³ is known that dental procedures that induce mucosal bleeding may cause transient bacteremias, ²⁸⁴ but generally these occurrences do not overwhelm an

intact immune system. Streptococcus pneumonia, H. influenzae²⁸⁵, E. coli, N. meningitides²⁸⁶ and Pseudomonas aeruginosa²⁸⁷ are not endogenous to the oral cavity and have not been shown²⁸⁸ to cause bacteremias from dental procedures³³

Some clinicians feel that prophylactic measures with antimicrobial medications are less effective than prompt recognition and treatment of infection with aggressive antibiotic therapy when asplenic patients become febrile.³⁴ There is evidence of prophylactic antimicrobial therapy failing to prevent infection in asplenic patients,²⁸⁹ and numerous animal studies have cast doubt on its efficacy²⁹⁰^{35,36} Because compliance with long term, routine antibiotic prophylaxis is unreliable and its efficacy remains unproven in prospective randomized trials, it is prudent to avoid indiscriminatory use of antibiotic prophylaxis before dental procedures.²⁹¹ Patient was on medication (i.e. Tab. Pentid 400 mg once a day, contained penicillin G potassium)²⁹² for last 14 years which was prescribed by his physician, there were no history of any complication after taking this antibiotic dose, no history of any surgical procedure patient underwent during this prophylaxis, also no history of any infection (e.g. Overwhelming Post Splenectomy Infection).²⁹³ Before performing periodontal surgery²⁹⁴ the patient was asked to take a dose of his routine antibiotics, after the surgical procedure he was suggested for taking analgesics if needed.²⁹⁶²⁹⁷

When treating other immunocompromised patients, dentists can take certain measures during the perioperative period to minimize the chance of infection.³⁰⁰ Patient education and scrupulous oral hygiene, use of antimicrobial mouthrinses before and after dental procedures, aggressive elimination of potential intraoral sources of infection³⁰¹ and frequent oral health maintenance all serve to minimize infectious complications in these patients³⁰²^{303,304} Dental practitioners are

³¹⁴ urged to consult with the patient's physician regarding the patient's overall medical status. ³¹⁵ Risk of infection and sepsis is only one concern in the asplenic patient. The dental practitioner also must examine the reason for asplenia and correlate dental therapy with the medical condition of the patient. ³¹⁶

⁴¹¹ Thrombocytopenia, a condition in which there is a reduced number of platelets in the peripheral blood, is associated with ³¹⁷ a number of diseases and conditions, including leukemia, lymphoma, certain anemias, systemic lupus erythematosus, HIV infection and ³¹⁸ hypersplenism. This condition also can be autoimmune-related, drug-related ³¹⁹ or idiopathic. It is believed that in ³²⁰ ³²¹ some of these diseases and conditions, platelets are attacked by antibodies and subsequently destroyed in the spleen. Initial therapy to increase the number of platelets focuses on ³²² reduction of antibody production by high dose, long-term corticosteroid therapy. ³²³ When this treatment modality fails, splenectomy ¹¹ is usually indicated³⁸Therefore, asplenic ³²⁴ patients may often suffer from underlying conditions that may alter routine dental procedures. Patients with ITP who have undergone splenectomy ¹¹ also have been shown to be ³²⁵ at increased risk of developing chronic active hepatitis.³⁹The body's immunological armor is damaged with ³²⁶ removal ³²⁷ of the spleen, providing a gateway for infections with ⁴¹² poorly opsonized bacteria. Sepsis in the splenectomised ³²⁸ individual is often severe and associated with high morbidity and mortality. Ongoing prevention with vaccination, antibiotic prophylaxis, and patient education is imperative in reducing the risk of infection. ³²⁹ Treatment ³³⁰ of the patient with chronic and chronic-acute viral hepatitis involves evaluation of ³³¹ liver function to rule out bleeding tendencies and altered drug metabolism.

CONCLUSION

With advancing medical and technological prowess, many people are living ³³² their lives without an important ³³³ organ or a group of organs. Similarly ³³⁴ many

people have transplanted or added organs ³³⁵ and the number of such survivors will increase in the future. Such patients will ³³⁶ definitely require dental treatment also. A dentist should ³³⁷ not only be knowledgeable about these ³³⁸ eventualities but also be able to manage them as and when necessary.

⁴¹³ The burden is on the general dentist to understand the immunological condition of patients who are asplenic or have splenic dysfunction and ³³⁹ to recognize associated underlying conditions that may require modification of dental care. The identification and prompt management in the high probability of infection provide the ³⁴⁰ splenectomised individual the best chance of early recovery.

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15. Figure 15 Osteotomy followed by apicoectomy done w,r,t³⁸⁴,21,22
16. Figure 16 Continuous slings³⁸⁵ sutures placed
17. Figure 17 Post-operative radiograph
18. Figure 18 After suture removal (8 days after)
19. Figure 19 Radiograph after 1³⁸⁶ month follow up
20. Figure 20 Follow up after 1³⁸⁷ month

1.	<i>Nonsurgical; nonsurgical; non-surgical</i>	Text Inconsistencies	Correctness
2.	, but	Punctuation in Compound/Complex Sentences	Correctness
3.	<i>surgery; Surgery</i>	Text Inconsistencies	Correctness
4.	<i>be indicated</i>	Passive Voice Misuse	Clarity
5.	<i>periradicular</i>	Unknown Words	Correctness
6.	to it	Wordy Sentences	Clarity
7.	indicates → shows	Word Choice	Engagement
8.	a scenario	Determiner Use (a/an/the/this, etc.)	Correctness
9.	scenario,	Comma Misuse within Clauses	Correctness
10.	. Following	Improper Formatting	Correctness
11.	<i>splenectomy; Splenectomy</i>	Text Inconsistencies	Correctness
12.	earnimorsus → carnivorous	Misspelled Words	Correctness
13.	, and	Comma Misuse within Clauses	Correctness
14.	<i>holmesii</i>	Unknown Words	Correctness
15.		Intricate Text	Clarity
16.	. After	Improper Formatting	Correctness
17.	Initially,	Comma Misuse within Clauses	Correctness
18.	leukocytosisis → leukocytosis, leukocytosis is	Misspelled Words	Correctness
19.	Splenectomised →	Mixed Dialects of English	Correctness

Splenectomized

20.	to → of	Wrong or Missing Prepositions	Correctness
21.	, to,	Punctuation in Compound/Complex Sentences	Correctness
22.	. The	Improper Formatting	Correctness
23.	. This	Improper Formatting	Correctness
24.	a management → the management	Determiner Use (a/an/the/this, etc.)	Correctness
25.	<i>periradicular</i>	Unknown Words	Correctness
26.	32-year old → 32-year-old	Misspelled Words	Correctness
27.	who has → who has	Misspelled Words	Correctness
28.		Intricate Text	Clarity
29.	. The	Improper Formatting	Correctness
30.	the first	Determiner Use (a/an/the/this, etc.)	Correctness
31.	<i>endodontically</i>	Unknown Words	Correctness
32.	, that	Punctuation in Compound/Complex Sentences	Correctness
33.	that was → which was	Pronoun Use	Correctness
34.	<i>was followed</i>	Passive Voice Misuse	Clarity
35.	periodontal surgicaltreatment	Improper Formatting	Correctness
36.	surgical treatment	Misspelled Words	Correctness
37.	dento → to	Misspelled Words	Correctness

38.	salveolar → alveolar	Misspelled Words	Correctness
39.	a radiographic, or the radiographic	Determiner Use (a/an/the/this, etc.)	Correctness
40.	be classified	Passive Voice Misuse	Clarity
41.	a radicular	Determiner Use (a/an/the/this, etc.)	Correctness
42.	, or	Comma Misuse within Clauses	Correctness
43.	. For	Improper Formatting	Correctness
44.	lesions,	Comma Misuse within Clauses	Correctness
45.	treatment → treatments	Incorrect Noun Number	Correctness
46.	still,	Comma Misuse within Clauses	Correctness
47.	nonsurgical → non-surgical	Confused Words	Correctness
48.	retreatment; re-treatment	Text Inconsistencies	Correctness
49.		Intricate Text	Clarity
50.	the complex	Determiner Use (a/an/the/this, etc.)	Correctness
51.	injuries,	Punctuation in Compound/Complex Sentences	Correctness
52.	non-surgical → nonsurgical, non-surgical	Misspelled Words	Correctness
53.	would be → would be	Improper Formatting	Correctness
54.	periapical surgery	Misspelled Words	Correctness
55.	an endodontist	Determiner Use (a/an/the/this, etc.)	Correctness

56.	, and	Comma Misuse within Clauses	Correctness
57.	, or	Improper Formatting	Correctness
58.	Practitioner → Practitioner	Misspelled Words	Correctness
59.	root end → root-end	Misspelled Words	Correctness
60.	, the → ; the, , and the, . The	Punctuation in Compound/Complex Sentences	Correctness
61.	and/or → and, or	Inappropriate Colloquialisms	Delivery
62.	, or	Punctuation in Compound/Complex Sentences	Correctness
63.	great → high, significant, considerable	Word Choice	Engagement
64.	and/or → and, or	Inappropriate Colloquialisms	Delivery
65.		Intricate Text	Clarity
66.	prothesis → prosthesis	Confused Words	Correctness
67.	be restored	Passive Voice Misuse	Clarity
68.		Intricate Text	Clarity
69.	contraindications	Confused Words	Correctness
70.	contra-indications	Wordy Sentences	Clarity
71.	In → An	Confused Words	Correctness
72.	endodontically	Unknown Words	Correctness
73.	the surgical	Determiner Use (a/an/the/this, etc.)	Correctness
74.	wide → extensive, full	Word Choice	Engagement

75.	millimetres → millimeters	Mixed Dialects of English	Correctness
76.	<i>be removed</i>	Passive Voice Misuse	Clarity
77.	<i>be performed</i>	Passive Voice Misuse	Clarity
78.	are known to	Wordy Sentences	Clarity
79.	<i>are urged</i>	Passive Voice Misuse	Clarity
80.	the patient's → their	Wordy Sentences	Clarity
81.	overall → global	Word Choice	Engagement
82.	The risk	Determiner Use (a/an/the/this, etc.)	Correctness
83.		Intricate Text	Clarity
84.	.(	Improper Formatting	Correctness
85.	. It	Punctuation in Compound/Complex Sentences	Correctness
86.	a white	Determiner Use (a/an/the/this, etc.)	Correctness
87.	, and	Comma Misuse within Clauses	Correctness
88.	pulp → flesh	Word Choice	Engagement
89.	the presence of	Wordy Sentences	Clarity
90.	. The	Improper Formatting	Correctness
91.	pulp → flesh	Word Choice	Engagement
92.	appearance → emergence	Word Choice	Engagement
93.		Intricate Text	Clarity

94.	an important → a vital, an essential	Word Choice	Engagement
95.	defence → defense	Mixed Dialects of English	Correctness
96.	the removal	Determiner Use (a/an/the/this, etc.)	Correctness
97.	important → vital, critical	Word Choice	Engagement
98.	, which	Improper Formatting	Correctness
99.		Intricate Text	Clarity
100.	1826,	Punctuation in Compound/Complex Sentences	Correctness
101.	spleen → venom, anger	Word Choice	Engagement
102.	. Red	Improper Formatting	Correctness
103.	centres → centers	Mixed Dialects of English	Correctness
104.	that are	Wordy Sentences	Clarity
105.	. The	Improper Formatting	Correctness
106.	, including	Punctuation in Compound/Complex Sentences	Correctness
107.	spleen → anger, venom	Word Choice	Engagement
108.	is thought	Passive Voice Misuse	Clarity
109.	in addition to → and	Wordy Sentences	Clarity
110.	the sequestration	Determiner Use (a/an/the/this, etc.)	Correctness
111.		Intricate Text	Clarity
112.	was considered	Passive Voice Misuse	Clarity

113.	to be	Wordy Sentences	Clarity
114.	deemed to be unnecessary for, deemed unnecessary to	Word Choice	Engagement
115.	post-splenectomy	Misspelled Words	Correctness
116.	spleen → anger	Word Choice	Engagement
117.	aged,	Comma Misuse within Clauses	Correctness
118.	; splenectomized, , and splenectomized, . Splenectomized	Punctuation in Compound/Complex Sentences	Correctness
119.	recoveringfrom → recovering from	Misspelled Words	Correctness
120.	haemophilus → Haemophilus	Misspelled Words	Correctness
121.	influenzae	Unknown Words	Correctness
122.	, and	Comma Misuse within Clauses	Correctness
123.	an increased	Determiner Use (a/an/the/this, etc.)	Correctness
124.	haematoma → hematoma	Mixed Dialects of English	Correctness
125.	A splenic	Determiner Use (a/an/the/this, etc.)	Correctness
126.	e.g.,	Comma Misuse within Clauses	Correctness
127.	, As	Improper Formatting	Correctness
128.	tumour → tumor	Mixed Dialects of English	Correctness
129.	e.g.,	Comma Misuse within Clauses	Correctness
130.	, Aneurysm	Improper Formatting	Correctness

131.	the splenic, or a splenic	Determiner Use (a/an/the/this, etc.)	Correctness
132.	Haemorrhage → Hemorrhage	Mixed Dialects of English	Correctness
133.	Haemorrhage → Hemorrhage	Mixed Dialects of English	Correctness
134.	Spleno → Splenic	Misspelled Words	Correctness
135.	atherosclerosis	Misspelled Words	Correctness
136.	post-splenectomy	Misspelled Words	Correctness
137.	infection.	Closing Punctuation	Correctness
138.	antibody.	Closing Punctuation	Correctness
139.	immune-suppressing	Misspelled Words	Correctness
140.	and/or → and, or	Inappropriate Colloquialisms	Delivery
141.	6 → six	Improper Formatting	Correctness
142.	radiotherapy.	Closing Punctuation	Correctness
143.	High risk → High-risk	Misspelled Words	Correctness
144.	patterns.	Closing Punctuation	Correctness
145.	Low risk → Low-risk	Misspelled Words	Correctness
146.	Counselled → Counseled	Mixed Dialects of English	Correctness
147.	long → prolonged	Word Choice	Engagement
148.	aggressively.	Closing Punctuation	Correctness
149.	haematology → hematology	Mixed Dialects of English	Correctness
150.	therapyand → therapy and, therapy	Misspelled Words	Correctness

151.	the use	Determiner Use (a/an/the/this, etc.)	Correctness
152.	with use of → using	Wordy Sentences	Clarity
153.	patient,	Punctuation in Compound/Complex Sentences	Correctness
154.	a vigilant → a careful	Word Choice	Engagement
155.	32-year-old → 32-year-old	Misspelled Words	Correctness
156.	institute → Institute	Misspelled Words	Correctness
157.	scinces → sciences, science	Misspelled Words	Correctness
158.	the upper	Determiner Use (a/an/the/this, etc.)	Correctness
159.	the last	Determiner Use (a/an/the/this, etc.)	Correctness
160.	2 → two	Improper Formatting	Correctness
161.	A 32 year old male reported to the Department of Periodontics at Maharashtra institute of dental scinces, Latur with a chief complaint of pus discharge and pain in upper front region of jaw since last 2 weeks .	Incomplete Sentences	Correctness
162.	weeks .	Improper Formatting	Correctness
163.	. Medical	Improper Formatting	Correctness
164.	Acomplete → A complete	Misspelled Words	Correctness
165.	was carried	Passive Voice Misuse	Clarity
166.	outand → out and	Misspelled Words	Correctness

167.	Haemoglobin → Hemoglobin	Mixed Dialects of English	Correctness
168.	<i>cumm</i>	Unknown Words	Correctness
169.	ration → ratio	Confused Words	Correctness
170.	<i>Kidney function test Serum creatinine</i>	Intricate Text	Clarity
171.	6 → six	Improper Formatting	Correctness
172.	. Dental	Improper Formatting	Correctness
173.	revealed traumato	Improper Formatting	Correctness
174.	traumato → trauma to	Misspelled Words	Correctness
175.	the labial	Determiner Use (a/an/the/this, etc.)	Correctness
176.	. Ellis	Improper Formatting	Correctness
177.	<i>was suggested</i>	Passive Voice Misuse	Clarity
178.	, which	Punctuation in Compound/Complex Sentences	Correctness
179.	Accordingly,	Comma Misuse within Clauses	Correctness
180.	4 → four	Improper Formatting	Correctness
181.	months ,	Punctuation in Compound/Complex Sentences	Correctness
182.	months ,	Improper Formatting	Correctness
183.	, after	Improper Formatting	Correctness
184.	treatment,	Punctuation in Compound/Complex Sentences	Correctness
185.	, until	Improper Formatting	Correctness

186.	the department	Determiner Use (a/an/the/this, etc.)	Correctness
187.	complains → complaints	Confused Words	Correctness
188.		Intricate Text	Clarity
189.	tract is, or tract was	Incorrect Verb Forms	Correctness
190.	in relation to → about, to, with, concerning	Wordy Sentences	Clarity
191.	reddish pink → reddish-pink	Misspelled Words	Correctness
192.	, Gingival → ; Gingival, , and Gingival, . Gingival	Punctuation in Compound/Complex Sentences	Correctness
193.	. (	Improper Formatting	Correctness
194.	, or	Comma Misuse within Clauses	Correctness
195.	a necrosed	Determiner Use (a/an/the/this, etc.)	Correctness
196.	plaque induced → plaque-induced	Misspelled Words	Correctness
197.	a systemic, or the systemic	Determiner Use (a/an/the/this, etc.)	Correctness
198.	splenectomised → splenectomized	Mixed Dialects of English	Correctness
199.		Intricate Text	Clarity
200.	therapy,	Punctuation in Compound/Complex Sentences	Correctness
201.	, if required	Wordy Sentences	Clarity
202.	the periodontal	Determiner Use (a/an/the/this, etc.)	Correctness

203.	<i>are started</i>	Passive Voice Misuse	Clarity
204.	first → early	Word Choice	Engagement
205.	<i>were performed</i>	Passive Voice Misuse	Clarity
206.	. The	Improper Formatting	Correctness
207.	the necrotic	Determiner Use (a/an/the/this, etc.)	Correctness
208.	<i>was removed</i>	Passive Voice Misuse	Clarity
209.	was → were	Faulty Subject-Verb Agreement	Correctness
210.	usingstainless → using stainless	Misspelled Words	Correctness
211.	ethylenediaminetetraacetic	Confused Words	Correctness
212.	, and	Punctuation in Compound/Complex Sentences	Correctness
213.	<i>was used</i>	Passive Voice Misuse	Clarity
214.	in	Wordy Sentences	Clarity
215.	→ → ., ...	Closing Punctuation	Correctness
216.	, and	Punctuation in Compound/Complex Sentences	Correctness
217.	water based → water-based	Misspelled Words	Correctness
218.	<i>was given</i>	Passive Voice Misuse	Clarity
219.	a period	Determiner Use (a/an/the/this, etc.)	Correctness
220.	period of	Wordy Sentences	Clarity

221.	. The	Improper Formatting	Correctness
222.	, and	Punctuation in Compound/Complex Sentences	Correctness
223.	sign → signs	Incorrect Noun Number	Correctness
224.	done → did, has done	Incorrect Verb Forms	Correctness
225.	a Bio-dentine	Determiner Use (a/an/the/this, etc.)	Correctness
226.	<i>thermoplastisized</i>	Unknown Words	Correctness
227.	.(	Improper Formatting	Correctness
228.	. Post	Improper Formatting	Correctness
229.	done → was done	Incorrect Verb Forms	Correctness
230.	<i>was re-examined</i>	Passive Voice Misuse	Clarity
231.	a review	Determiner Use (a/an/the/this, etc.)	Correctness
232.	gutta-percha → gutta-percha	Misspelled Words	Correctness
233.	<i>was confirmed</i>	Passive Voice Misuse	Clarity
234.	. Patient	Improper Formatting	Correctness
235.	The patient	Determiner Use (a/an/the/this, etc.)	Correctness
236.	<i>was planned</i>	Passive Voice Misuse	Clarity
237.	<i>was performed</i>	Passive Voice Misuse	Clarity
238.	a local	Determiner Use (a/an/the/this, etc.)	Correctness
239.	anaesthetic → anesthetic	Mixed Dialects of English	Correctness

240.	. Trapezoidal	Improper Formatting	Correctness
241.	was planned	Passive Voice Misuse	Clarity
242.	full thickness → full-thickness	Misspelled Words	Correctness
243.	were raised	Passive Voice Misuse	Clarity
244.	at	Wordy Sentences	Clarity
245.	full thickness → full-thickness	Misspelled Words	Correctness
246.	the periapical	Determiner Use (a/an/the/this, etc.)	Correctness
247.	bya → by a, by	Misspelled Words	Correctness
248.	osteotomy produced	Improper Formatting	Correctness
249.	root end → root-end	Misspelled Words	Correctness
250.	, filling	Punctuation in Compound/Complex Sentences	Correctness
251.	made	Wordy Sentences	Clarity
252.	was → were	Faulty Subject-Verb Agreement	Correctness
253.	continuous sling	Improper Formatting	Correctness
254.	patient-reported	Misspelled Words	Correctness
255.		Intricate Text	Clarity
256.	periradicular	Unknown Words	Correctness
257.	surgery → medicine, operation	Word Choice	Engagement
258.	dontically → domestically, identically	Misspelled Words	Correctness

259.	<i>be assessed</i>	Passive Voice Misuse	Clarity
260.	. Only	Improper Formatting	Correctness
261.	apice → pico, apical	Misspelled Words	Correctness
262.	<i>is based</i>	Passive Voice Misuse	Clarity
263.	<i>be extracted</i>	Passive Voice Misuse	Clarity
264.	compared → examined	Word Choice	Engagement
265.	,the → ; the, , and the, . The	Punctuation in Compound/Complex Sentences	Correctness
266.	outcome → issue, result	Word Choice	Engagement
267.	low → flat	Word Choice	Engagement
268.	compared to → than	Wordy Sentences	Clarity
269.	important → vital	Word Choice	Engagement
270.	perie → period	Misspelled Words	Correctness
271.	in particular → particularly	Wordy Sentences	Clarity
272.	buccal → oral	Word Choice	Engagement
273.	with	Wordy Sentences	Clarity
274.	prior to → before	Wordy Sentences	Clarity
275.	width → diameter	Word Choice	Engagement
276.	<i>been recommended</i>	Passive Voice Misuse	Clarity
277.	root end → root-end	Misspelled Words	Correctness
278.	an ideal → a perfect	Word Choice	Engagement

279.	material → article	Word Choice	Engagement
280.	an asplenic	Determiner Use (a/an/the/this, etc.)	Correctness
281.	can → could	Faulty Tense Sequence	Correctness
282.	occurred → happened	Word Choice	Engagement
283.	is known	Passive Voice Misuse	Clarity
284.	. Still, generally	Hard-to-read text	Clarity
285.	influenzae	Unknown Words	Correctness
286.	, and	Comma Misuse within Clauses	Correctness
287.	aeruginosa	Unknown Words	Correctness
288.	been shown	Passive Voice Misuse	Clarity
289.	prophylactic → preventive	Word Choice	Engagement
290.	infection → disease	Word Choice	Engagement
291.	, and	Punctuation in Compound/Complex Sentences	Correctness
292.	indiscriminatory → discriminatory, in discriminatory	Misspelled Words	Correctness
293.	34There is evidence of prophylactic antimicrobial therapy failing to prevent infection in asplenic patients,' and numerous animal studies have cast doubt on its efficacy35,36Because compliance with long term, routine antibiotic prophylaxis is unreliable and its efficacy remains unproven in prospect...	Hard-to-read text	Clarity
294.	The patient	Determiner Use (a/an/the/this,	Correctness

		etc.)	
295.	i.e → i.e.	Comma Misuse within Clauses	Correctness
296.	were no → were no, were	Misspelled Words	Correctness
297.	of any → of any	Improper Formatting	Correctness
298.	procedure patient	Improper Formatting	Correctness
299.	patient underwent	Improper Formatting	Correctness
300.	e.g → e.g.	Comma Misuse within Clauses	Correctness
301.	<i>Patient was on medication (i.e Tab.Pentid 400 mg once a day, contained penicillin G potassium) for last 14 years which was prescribed by his physician, there wereno history of any complication after taking this antibiotic dose, no history of any surgical procedure patient underwent during this ...</i>	Hard-to-read text	Clarity
302.	surgery,	Punctuation in Compound/Complex Sentences	Correctness
303.	,after → ; after, . After	Punctuation in Compound/Complex Sentences	Correctness
304.	, after	Improper Formatting	Correctness
305.	procedure,	Punctuation in Compound/Complex Sentences	Correctness
306.	<i>was suggested</i>	Passive Voice Misuse	Clarity
307.	eertain → specific	Word Choice	Engagement
308.	perioperative period	Misspelled Words	Correctness
309.	thechance → the chance	Misspelled Words	Correctness

310.	educationand → education and	Misspelled Words	Correctness
311.	, use	Improper Formatting	Correctness
312.	antimicrobialmouthrinses	Unknown Words	Correctness
313.	infection → contamination	Word Choice	Engagement
314.	are urged	Passive Voice Misuse	Clarity
315.	The risk	Determiner Use (a/an/the/this, etc.)	Correctness
316.		Intricate Text	Clarity
317.	a number of → several, some, many	Wordy Sentences	Clarity
318.	, and	Comma Misuse within Clauses	Correctness
319.	, or	Comma Misuse within Clauses	Correctness
320.	is believed	Passive Voice Misuse	Clarity
321.	It is believed that in → In	Wordy Sentences	Clarity
322.	the reduction	Determiner Use (a/an/the/this, etc.)	Correctness
323.		Intricate Text	Clarity
324.	, asplenic → ; asplenic, , and asplenic, . Asplenic	Punctuation in Compound/Complex Sentences	Correctness
325.	have been shown to be → are	Wordy Sentences	Clarity
326.	the removal	Determiner Use (a/an/the/this, etc.)	Correctness
327.	with removal of → by removing	Wordy Sentences	Clarity

328.	splenectomised → splenectomized	Mixed Dialects of English	Correctness
329.		Intricate Text	Clarity
330.	. Treatment	Improper Formatting	Correctness
331.	evaluation of → evaluating	Wordy Sentences	Clarity
332.	are living → live	Wordy Sentences	Clarity
333.	an important → a vital, a critical	Word Choice	Engagement
334.	Similarly,	Comma Misuse within Clauses	Correctness
335.	, and	Punctuation in Compound/Complex Sentences	Correctness
336.	definitely	Wordy Sentences	Clarity
337.	be not only knowledgeable	Faulty Parallelism	Correctness
338.		Intricate Text	Clarity
339.	to	Wordy Sentences	Clarity
340.	splenectomised → splenectomized	Mixed Dialects of English	Correctness
341.	, Chueh	Improper Formatting	Correctness
342.	<i>periradicular</i>	Unknown Words	Correctness
343.	<i>periradicular</i>	Unknown Words	Correctness
344.	, PV.	Improper Formatting	Correctness
345.	Restor → Restore	Misspelled Words	Correctness
346.	Styrt → Start	Misspelled Words	Correctness

347.	Schummacher → Schumacher	Misspelled Words	Correctness
348.	babesia → babesia	Misspelled Words	Correctness
349.	, 1975	Punctuation in Compound/Complex Sentences	Correctness
350.	; l:516	Improper Formatting	Correctness
351.	Stevemse → Stevens	Misspelled Words	Correctness
352.		Intricate Text	Clarity
353.	standards → Standards	Misspelled Words	Correctness
354.	Task force → Taskforce	Confused Words	Correctness
355.	, ReganJD	Improper Formatting	Correctness
356.	, GutmannJL.the	Improper Formatting	Correctness
357.	, and	Comma Misuse within Clauses	Correctness
358.	one visit → one-visit	Misspelled Words	Correctness
359.	Zuole → Solo, Zolo	Misspelled Words	Correctness
360.	<i>periradicular</i>	Unknown Words	Correctness
361.	a prospective clinical	Misplaced Words or Phrases	Correctness
362.		Intricate Text	Clarity
363.	Vinzons → Vincent	Misspelled Words	Correctness
364.	rgin → in	Misspelled Words	Correctness
365.	resurgery → surgery	Misspelled Words	Correctness
366.	Nisongard → Isengard	Misspelled Words	Correctness

367.	, 1987	Punctuation in Compound/Complex Sentences	Correctness
368.	, 1984	Punctuation in Compound/Complex Sentences	Correctness
369.	penicillin is, or penicillin was	Incorrect Verb Forms	Correctness
370.	...	Misuse of Semicolons, Quotation Marks, etc.	Correctness
371.	, and	Comma Misuse within Clauses	Correctness
372.	Haemotol → Haematol	Misspelled Words	Correctness
373.	haematology → hematology	Mixed Dialects of English	Correctness
374.	the spleen	Determiner Use (a/an/the/this, etc.)	Correctness
375.	Cross section → Cross-section	Misspelled Words	Correctness
376.	the spleen	Determiner Use (a/an/the/this, etc.)	Correctness
377.	the necrotic	Determiner Use (a/an/the/this, etc.)	Correctness
378.	pulp,	Punctuation in Compound/Complex Sentences	Correctness
379.	was achieved	Passive Voice Misuse	Clarity
380.	Water based → Water-based	Misspelled Words	Correctness
381.	thermoplastisized	Unknown Words	Correctness
382.	gutta percha → gutta-percha	Misspelled Words	Correctness
383.	Full thickness → Full-thickness	Misspelled Words	Correctness
384.	t,	Improper Formatting	Correctness

385.	sling eling	Misspelled Words	Correctness
386.	1 → one	Improper Formatting	Correctness
387.	1 → one	Improper Formatting	Correctness
388.	<i>Following splenectomy, individuals have an elevated risk of infection, in particular to encapsulated bacteria, Gram-negative pathogens such as Capnocytophagia carnimorsus and Bordetella holmesii,</i>	[Full text] Post-splenectomy sepsis: preventative ... https://www.dovepress.com/post-splenectomy-sepsis-preventative-strategies-challenges-and-solutio-peer-reviewed-fulltext-article-IDR	Originality
389.	<i>After the failure of the conventional root canal treatment,</i>	A case of periradicular surgery: apicoectomy and ... https://sdsjournal.com/article/view/1747/	Originality
390.	<i>an apicoectomy was well defined in 1884 by J. Farrar as "a bold act, which removes the entire cause [of disease]and which will lead to a permanent cure may not be the best in the end, but the most</i>	A case of periradicular surgery: apicoectomy and ... https://sdsjournal.com/article/view/1747/	Originality
391.	<i>resection and preparation, the root canal filling is placed within the created cavity to close the path of communication between infected root canal system and</i>	A case of periradicular surgery: apicoectomy and ... https://sdsjournal.com/article/view/1747/	Originality
392.	<i>1)Radiological findings of apical periodontitis and/or symptoms associated with an obstructed canal (the obstruction proved not to be removable, displacement did not seem feasible or the risk of damage was too great). (2)Extruded material with clinical or radiological findings of apical periodontit...</i>	Quality guidelines for endodontic treatment: consensus ... https://onlinelibrary.wiley.com/doi/full/10.1111/j.1365-2591.2006.01180.x	Originality
393.	<i>is inappropriate. (4)Perforation of the root or the floor of the pulp chamber</i>	Quality guidelines for endodontic treatment: consensus ...	Originality

	<i>and where it is impossible to treat from within the pulp cavity.</i>	https://onlinelibrary.wiley.com/doi/full/10.1111/j.1365-2591.2006.01180.x	
394.	<i>the tooth has no function (no antagonist, no strategic importance serving as a pillar for a fixed prothesis</i>	(PDF) Endodontic Surgery -A Review https://www.researchgate.net/publication/333405537_Endodontic_Surgery_-A_Review	Originality
395.	<i>the tooth has inadequate periodontal support, or the tooth has a vertical root fracture. Additional general contra- indications may be an uncooperative patient or a patient with a compromised medical history for an oral surgical</i>	(PDF) Endodontic Surgery -A Review https://www.researchgate.net/publication/333405537_Endodontic_Surgery_-A_Review	Originality
396.	<i>Patients who have undergone splenectomy are known to</i>	Recommended Treatment for Antibody-mediated Rejection ... https://journals.lww.com/transplantjournal/Fulltext/2020/05000/Recommended_Treatment_for_Antibody_mediated.11.aspx	Originality
397.	<i>The spleen plays an important role in the body's</i>	Dental considerations in asplenic patients — Augusta ... https://augusta.pure.elsevier.com/en/publications/dental-considerations-in-asplenic-patients	Originality
398.	<i>mechanism against microbial infections. However, trauma or diseases sometimes make removal of this important organ necessary,which predisposes patients to certain infections. This increased risk of infection and the underlying reason for the organ's removal both may affect the provision of dental c...</i>	Dental considerations in asplenic patients — Augusta ... https://augusta.pure.elsevier.com/en/publications/dental-considerations-in-asplenic-patients	Originality
399.	<i>Spleen function: Immunological function The spleen can initiate immune responses to blood-borne antigens, produce antibodies, and</i>	[Full text] Post-splenectomy sepsis: preventative ... https://www.dovepress.com/post-splenectomy-sepsis-	Originality

	<i>clear antibody-mediated pathogens. The spleen consists of cells involved in both innate and adaptive immunity.</i>	preventative-strategies-challenges-and-solutio-peer-reviewed-fulltext-article-IDR	
400.	<i>Red pulp macrophages filter the blood and remove bacteria, damaged erythrocytes, and erythrocyte inclusions. Marginal zone macrophages remove cellular debris in the marginal zone and tingible body macrophages</i>	[Full text] Post-splenectomy sepsis: preventative ... https://www.dovepress.com/post-splenectomy-sepsis-preventative-strategies-challenges-and-solutio-peer-reviewed-fulltext-article-IDR	Originality
401.	<i>tingible body macrophage is a type of macrophage predominantly found in germinal</i>	Tingible body macrophage - Wikipedia https://en.wikipedia.org/wiki/Tingible_body_macrophage	Originality
402.	<i>containing many phagocytized, apoptotic cells in various states of degradation, referred to as tingible</i>	Tingible body macrophage - Wikipedia https://en.wikipedia.org/wiki/Tingible_body_macrophage	Originality
403.	<i>remove B-cell debris in the germinal center of the follicle. In addition to macrophages, there are also dendritic cells, natural killer cells, and monocytes that are involved in inducing T cell responses to pathogens.</i>	[Full text] Post-splenectomy sepsis: preventative ... https://www.dovepress.com/post-splenectomy-sepsis-preventative-strategies-challenges-and-solutio-peer-reviewed-fulltext-article-IDR	Originality
404.	<i>The white pulp of the spleen is B-cell dominant (follicles) with some T cell zones. Splenic B cells</i>	[Full text] Post-splenectomy sepsis: preventative ... https://www.dovepress.com/post-splenectomy-sepsis-preventative-strategies-challenges-and-solutio-peer-reviewed-fulltext-article-IDR	Originality
405.	<i>The spleen also sequesters blood cells including platelets. The spleen is thought to pool approximately one-third of the total platelet volume in addition to sequestration of erythrocytes and granulocytes. Tests of splenic function evaluate the</i>	[Full text] Post-splenectomy sepsis: preventative ... https://www.dovepress.com/post-splenectomy-sepsis-preventative-strategies-challenges-and-solutio-peer-reviewed-fulltext-article-IDR	Originality

capacity of the spleen to remove intra-erythrocytic in...

406.	<i>Medical history revealed that he was diagnosed with</i>	Turkish Journal of Vascular Surgery http://www.turkishjournalofvascularsurgery.org/abstract.php?id=257	Originality
407.	<i>Discussion After the failure of the conventional root canal treatment (RCT), non-surgical retreatment is the preferred option in most cases. Several factors, such as a complex root canal system or previous procedural accidents, may impede the success of non-surgical retreatment. In these cases, pe...</i>	A case of periradicular surgery: apicoectomy and ... https://sdsjournal.com/article/view/1747/	Originality
408.	<i>Only a few clinical studies have compared the</i>	A retrospective comparison of Escherichia coli and ... https://www.spandidos-publications.com/ol/15/1/75	Originality
409.	<i>obturation, and many studies have attempted to identify an ideal material; however, an ideal material has not been</i>	A case of periradicular surgery: apicoectomy and ... https://sdsjournal.com/article/view/1747/	Originality
410.	<i>Patients who have undergone splenectomy are known to</i>	Recommended Treatment for Antibody-mediated Rejection ... https://journals.lww.com/transplantjournal/Fulltext/2020/05000/Recommended_Treatment_for_Antibody_mediated.11.aspx	Originality
411.	<i>is associated with a number of diseases and</i>	Regulatory T Cells and Influenza	Originality
412.	<i>individual is often severe and associated with high morbidity and mortality. Ongoing prevention with vaccination, antibiotic prophylaxis, and patient education is imperative in reducing the risk of infection.</i>	[Full text] Post-splenectomy sepsis: preventative ... https://www.dovepress.com/post-splenectomy-sepsis-preventative-strategies-challenges-and-solutio-peer-reviewed-fulltext-article-IDR	Originality

413.	<i>The burden is on the general dentist to</i>	What's the Difference Between a Dentist and an ... https://patch.com/connecticut/avon/whats-difference-between-dentist-orthodontist-0	Originality
414.	<i>Quality guidelines for endodontic treatment: consensus report of the European Society of Endodontology.</i>	Quality guidelines for endodontic treatment: consensus ... https://onlinelibrary.wiley.com/doi/full/10.1111/j.1365-2591.2006.01180.x	Originality
415.	<i>Lewis SM, Williams A, Eisenbarth SC. Structure and function of the immune system in the spleen. Sci Immunol. 2019;4:33.</i>	[Full text] Post-splenectomy sepsis: preventative ... https://www.dovepress.com/post-splenectomy-sepsis-preventative-strategies-challenges-and-solutio-peer-reviewed-fulltext-article-IDR	Originality
416.	<i>Susceptibility to infection after splenectomy performed in infancy. Ann Surg 1952;136:</i>	[Full text] Post-splenectomy sepsis: preventative ... https://www.dovepress.com/post-splenectomy-sepsis-preventative-strategies-challenges-and-solutio-peer-reviewed-fulltext-article-IDR	Originality
417.	<i>Guidelines for the prevention and treatment of infection in patients with an absent or dysfunctional spleen. Prepared on behalf of the British Committee for standards in Haematology</i>	Update of guidelines for the prevention and treatment of ... https://www.rcpjournals.org/content/clinmedicine/2/5/440.full-text.pdf	Originality
418.	<i>Tawil PZ, Trope M, Curran AE, Caplan DJ, Kirakozova A, Duggan DJ, Teixeira FB. Periapical microsurgery: an in vivo evaluation of endodontic root-end filling materials. J Endod 2009;35:357-62.</i>	A case of periradicular surgery: apicoectomy and ... https://sdsjournal.com/article/view/1747/	Originality

Final splint

by MIDSAR Dental

General metrics

6,604	952	83	3 min 48 sec	7 min 19 sec
characters	words	sentences	reading time	speaking time

Score




This text scores better than 35% of all texts checked by Grammarly







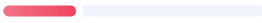
Writing Issues

120	80	40
Issues left	Critical	Advanced

Plagiarism

-  This text seems 100% original. Grammarly found no matching text on the Internet or in ProQuest's databases.

Writing Issues

94	Correctness	
4	Confused words	
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9	Punctuation in compound/complex sentences	
3	Closing punctuation	
6	Incorrect noun number	
3	Wrong or missing prepositions	
14	Misspelled words	
4	Incorrect verb forms	
2	Pronoun use	
1	Unknown words	
1	Misplaced words or phrases	
3	Faulty subject-verb agreement	
1	Improper formatting	
1	Conjunction use	
16	Clarity	
2	Hard-to-read text	
5	Wordy sentences	
4	Unclear sentences	
5	Passive voice misuse	
10	Engagement	
10	Word choice	

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Measures average word length

5.6characters per word

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Measures average sentence length

11.5words per sentence

Final splint

THE RECENT TECHNIQUE FOR MAXILLOMANDIBULAR FIXATION IN
MANDIBULAR FRACTURE USING VACCUM¹ SPLINT - CASE REPORT

Abstract:

In facial skeleton injuries² mandibular fractures are most³ commonly occurring fractures. They⁴ can be treated by Intermaxillary fixation alone or by osteosynthesis with, or without intermaxillary fixation.⁵ The⁶ main goals in successfully treating mandible fractures include reduction of the fracture, stabilization of the fracture, and achievement of proper dental occlusion⁷

KEYWORDS: VACCUM SPLINT, MANDIBULAR FRACTURE, PARTIALLY EDENTULOUS

INTRODUCTION:

Mandibular fractures are most⁸ common type of injuries⁹ of¹⁰ the facial skeleton. Road⁴ traffic accidents, industrial accidents, and interpersonal violence are some of the¹¹ common reasons. From⁴ the time of Hippocrates, many different techniques were described by physicians for treating mandibular fractures, the principle of which was repositioning and immobilization of the bony fragments.¹

In maxillofacial fracture treatment¹² IMF is very important¹³ and is usually achieved by fixing upper¹⁴ and lower arch¹⁵ bar¹⁶ with wires.² In recent years, different methods and material¹⁷ have been discovered for IMF.³

For mandible fractures¹⁸ intermaxillary fixation is a method of treatment.

Recently⁴ the newer method¹⁹ of intermaxillary fixation has been described.

Thermoplastic⁴ clear²⁰ foil is used to make vacuum formed²¹ splints and constructed²² for both the jaws.²³ Use of vacuum formed splints in the treatment^{25,26}

²⁷ of ²⁸ minimally ^{29 27,30} displace ²⁷ mandibular ³¹ fracture ³² it might be more advantageous in the relation ³³ periodontal ³⁴ health, cost, ³⁵ chair side ³⁶ time and ³ patient comfort. 1 This article reports the ³⁸ case ³⁹ of ⁴ left angle ⁴⁰ fracture ⁴² of ⁴⁰ mandible ³ of a 50- year ³ -old male that was successfully treated with open reduction internal fixation using ³⁸ vacuum ³⁹ splint ⁴ for intermaxillary ⁴⁰ fixation. The purpose of this case report ⁴⁰ to ⁴⁰ how to manage the mandibular fracture for intermaxillary ⁴² fixation in partially edentulous arches and periodontally compromised teeth using the vacuum splint.

CASE REPORT:

A 50-year-old male had ⁴³ history ⁴ of self-fall while walking. He ⁴ presented with ⁴⁴ displaced ⁴⁵ fracture ⁴⁶ of ⁴⁶ left ^{4,47,48} angle ⁴ of ⁴ mandible. Patients' oral hygiene was poor, and he had generalized periodontitis. ⁴ The medical history was not relevant. An ⁴⁹ orthopantogram ⁴ was taken. ⁴ Eyelets ⁵⁰ were placed at ⁵¹ maxillary ⁴ and mandibular anterior and posterior teeth ⁵¹ region. Several ⁴ mobile teeth were extracted, and ⁵² alginate ⁵³ impression ⁴ was taken. The ⁵⁴ alginate ⁵⁵ impressions ⁵⁴ had been ^{56,57} made ⁴ into working models ⁴ and a splint made from a 3 mm, dual laminate material ^{56,57} by ⁴ was formed from the stone models. ⁴ We made holes in ⁵⁸ vacuum splint over the teeth region where eyelets were placed. ⁴ Once ⁴ access ⁴ to the ⁵⁹ mandible ⁶⁰ had been ⁶¹ gained ⁶¹ from ⁶² intraoral ^{4,63} vestibular ⁶⁴ incision, we did IMF to reduce the ⁶¹ fractures, and to allow fixation with a 3-hole miniplate and screw at ⁶² external ^{4,65} oblique ^{4,63} ridge. Then ⁶⁴ closure ⁴ was done using 3-0 ⁶⁴ vicryl ⁴ suture. IMF was released. ^{4,65} Splint ^{4,66,67} was removed, and his occlusion was satisfactory. ⁴ Him ⁴ postoperative period was uneventful. ⁴ The patient is now on periodic evaluation and doing well.

Pre-operative Panoramic radiograph showing left angle fracture of mandible also generalized bone loss⁶⁸

The prepared vacuum formed splint⁶⁹ of maxillary⁷⁰ and mandibular arch⁷¹⁷²

Intra-operative image showing use⁷³ of vacuum splint of the temporary intermaxillary fixation during fracture reduction and fixation

DISCUSSION:

An important and a critical^{74,75} factor in the diagnostic workup of mandible fracture is the examination of patient's⁷⁶ occlusion⁷⁷. In acute setting⁷⁸ asking⁸⁰ patients if their "Bits feel normal" is highly⁷⁹ sensitive and very effective method⁸⁰.⁴

In the management of mandibular fractures, use of^{81,86} the⁸² dental occlusion as a guide is one of the most basic⁸³ concepts and⁸⁴ operative maxillomandibular fixation is vital to the surgeons⁸⁵ during reduction and immobilization.⁵

There are different kinds of maxillomandibular methods, which includes an Ivy loop wiring, an acrylated⁸⁷ arch bar, a wired arch bar, the Gottingen quick arch bar, a bonded arch bar, Dimac wire, thermoforming plates, and bone screw system. However⁴, these techniques are time consuming⁸⁸ and involve complicated techniques⁸⁹.⁴ ⁶

For intermaxillary fixation⁹⁰ newer methods has⁹¹ been described recently.⁶

Thermoplastic⁴ clear foil⁹² is used to make vacuum formed splints⁹³ and constructed for both the jaws⁹⁴. Vacuum formed splint⁹⁵ can be used in minimally displaced mandibular fractures treatment. It was not included in displaced⁹⁶ cases of mandibular fracture because vacuum formed splints⁹⁷ may not provide enough stability to hold the fracture segments.¹

The bite was not completely closed due to the thickness of the splint. Vacuum⁴ formed¹⁰⁰ splints are contoured closely over the occlusal surfaces and enable

good interdigtation of the dentition. The bite was opened ⁴ uniformly, ¹⁰¹ there ¹⁰² were no premature contacts ¹⁰³ and ¹⁰⁴ splint covered the entire occlusal surface.⁷

CONCLUSION:

In present ¹⁰⁵ case report, surgical management of mandibular angle fracture in partially edentulous with periodontally compromised teeth, using Vaccum ¹⁰⁶ splint for appropriate reduction of fractured fragement ¹⁰⁷ and intermaxillary ⁴ fixation. In presented ¹⁰⁸ case patients ^{109,110} oral ¹¹¹ hygiene and periodontal health ¹¹² was poor. In ⁴ such case using ¹¹³ Vacuum Formed Splints was ¹¹⁴ better choice as it reduces periodontal trauma, provide ^{115,116} good maintenance of oral hygiene. ¹¹⁷

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Lloyd T, Nightingale C, Edler R. The use of vacuum-formed splints for temporary intermaxillary fixation ¹²⁰inthe management of unilateral condylar fractures. British ⁴Journal of Oral and Maxillofacial Surgery. 2001 ⁴Aug 1;39(4):301-3.

1.	VACCUM → VACUUM	Confused words	Correctness
2.	injuries,	Comma misuse within clauses	Correctness
3.	the most	Determiner use (a/an/the/this, etc.)	Correctness
4.	. They; . The; . Road; . From; . Recently; . Thermoplastic; . Use; . He; . Patients'; . Eyelets; . Several; . We; . Once; . Then; . IMF; . Splint; . Him; . In; . However; . 6; . Vacuum; . It; . Journal; . 2014; . British; . 2004 Feb 1;42(1):61-3.; . Mandible; . Semin; . Operative; . 2016 Feb 1;54(...	Text inconsistencies	Correctness
5.	with,	Punctuation in compound/complex sentences	Correctness
6.	<i>They can be treated by Intermaxillary fixation alone or by osteosynthesis with, or without intermaxillary fixation.</i>	Hard-to-read text	Clarity
7.	occlusion.	Closing punctuation	Correctness
8.	the most	Determiner use (a/an/the/this, etc.)	Correctness
9.	injuries → injury	Incorrect noun number	Correctness
10.	of → on	Wrong or missing prepositions	Correctness
11.	some of the	Wordy sentences	Clarity
12.	treatment,	Comma misuse within clauses	Correctness
13.	very important → essential, critical, vital, significant	Word choice	Engagement
14.	the upper	Determiner use (a/an/the/this, etc.)	Correctness

15.	bar → bars	Incorrect noun number	Correctness
16.	2In → 2 In	Misspelled words	Correctness
17.	material → materials	Incorrect noun number	Correctness
18.	fractures,	Comma misuse within clauses	Correctness
19.	method → way	Word choice	Engagement
20.	clear → transparent	Word choice	Engagement
21.	vacuum formed → vacuum-formed	Misspelled words	Correctness
22.	is constructed	Incorrect verb forms	Correctness
23.	the jaws	Determiner use (a/an/the/this, etc.)	Correctness
24.	The use	Determiner use (a/an/the/this, etc.)	Correctness
25.	vacuum formed → vacuum-formed	Misspelled words	Correctness
26.	formed → developed, created, began, started	Word choice	Engagement
27.	<i>Use of vacuum formed splints in the treatment of minimally displace mandibular fracture it might be more advantageous in the relation periodontal health, cost, chair side time and patient comfort.</i>	Unclear sentences	Clarity
28.	displace → displaced	Incorrect verb forms	Correctness
29.	fracture → fractures	Incorrect noun number	Correctness
30.	it	Pronoun use	Correctness
31.	the relation	Determiner use (a/an/the/this, etc.)	Correctness

32.	to periodontal	Wrong or missing prepositions	Correctness
33.	chair-side → chair-side	Misspelled words	Correctness
34.	, and	Comma misuse within clauses	Correctness
35.	ease of	Wordy sentences	Clarity
36.	the mandible	Determiner use (a/an/the/this, etc.)	Correctness
37.	an old	Determiner use (a/an/the/this, etc.)	Correctness
38.	a vacuum	Determiner use (a/an/the/this, etc.)	Correctness
39.	fixation → focus, passion	Word choice	Engagement
40.	is to	Incorrect verb forms	Correctness
41.	to how → is	Wordy sentences	Clarity
42.	fixation → focus, passion, desire	Word choice	Engagement
43.	a history	Determiner use (a/an/the/this, etc.)	Correctness
44.	a displaced	Determiner use (a/an/the/this, etc.)	Correctness
45.	the left	Determiner use (a/an/the/this, etc.)	Correctness
46.	the mandible	Determiner use (a/an/the/this, etc.)	Correctness
47.	Patients' → Patient's	Confused words	Correctness
48.	The patients'	Determiner use (a/an/the/this, etc.)	Correctness

49.	orthopantogram → orthopantomogram	Misspelled words	Correctness
50.	the maxillary	Determiner use (a/an/the/this, etc.)	Correctness
51.	region → regions	Incorrect noun number	Correctness
52.	an alginate	Determiner use (a/an/the/this, etc.)	Correctness
53.	<i>alginate impression was taken</i>	Passive voice misuse	Clarity
54.	<i>The alginate impressions had been made</i>	Passive voice misuse	Clarity
55.	, and	Punctuation in compound/complex sentences	Correctness
56.	by	Wrong or missing prepositions	Correctness
57.	by	Wordy sentences	Clarity
58.	the vacuum	Determiner use (a/an/the/this, etc.)	Correctness
59.	<i>access to the mandible had been gained</i>	Passive voice misuse	Clarity
60.	the intraoral	Determiner use (a/an/the/this, etc.)	Correctness
61.	fractures,	Punctuation in compound/complex sentences	Correctness
62.	the external	Determiner use (a/an/the/this, etc.)	Correctness
63.	Then → The	Confused words	Correctness
64.	vicryl	Unknown words	Correctness
65.	The splint, or A splint	Determiner use	Correctness

		(a/an/the/this, etc.)	
66.	Him → His	Confused words	Correctness
67.	Him → His	Pronoun use	Correctness
68.	loss.	Closing punctuation	Correctness
69.	vacuum formed → vacuum-formed	Misspelled words	Correctness
70.	a splint	Determiner use (a/an/the/this, etc.)	Correctness
71.	the maxillary	Determiner use (a/an/the/this, etc.)	Correctness
72.	arch.	Closing punctuation	Correctness
73.	the use	Determiner use (a/an/the/this, etc.)	Correctness
74.	A critical	Wordy sentences	Clarity
75.	a critical	Determiner use (a/an/the/this, etc.)	Correctness
76.	the patient's	Determiner use (a/an/the/this, etc.)	Correctness
77.	an acute	Determiner use (a/an/the/this, etc.)	Correctness
78.	, asking	Punctuation in compound/complex sentences	Correctness
79.	a highly	Determiner use (a/an/the/this, etc.)	Correctness
80.	<i>In acute setting asking patients if their "Bits feel normal" is highly sensitive and very effective method.</i>	Unclear sentences	Clarity

81.	the use	Determiner use (a/an/the/this, etc.)	Correctness
82.	use of the → the use of	Misplaced words or phrases	Correctness
83.	most basic → most fundamental	Word choice	Engagement
84.	, and	Punctuation in compound/complex sentences	Correctness
85.	the surgeons	Determiner use (a/an/the/this, etc.)	Correctness
86.	<i>In the management of mandibular fractures, use of the dental occlusion as a guide is one of the most basic concepts and operative maxillomandibular fixation is vital to the surgeons during reduction and immobilization.</i>	Unclear sentences	Clarity
87.	acrylated → acrylate	Misspelled words	Correctness
88.	time consuming → time-consuming	Misspelled words	Correctness
89.	techniques → procedures, processes	Word choice	Engagement
90.	fixation,	Comma misuse within clauses	Correctness
91.	has → have	Faulty subject-verb agreement	Correctness
92.	clear → transparent	Word choice	Engagement
93.	vacuum formed → vacuum-formed	Misspelled words	Correctness
94.	is constructed	Incorrect verb forms	Correctness
95.	the jaws	Determiner use (a/an/the/this, etc.)	Correctness
96.	Vacuum formed → Vacuum-formed	Misspelled words	Correctness

97.	<i>It was not included</i>	Passive voice misuse	Clarity
98.	displaced → ejected	Word choice	Engagement
99.	vacuum formed → vacuum-formed	Misspelled words	Correctness
100.	Vacuum formed → Vacuum-formed	Misspelled words	Correctness
101.	<i>The bite was opened</i>	Passive voice misuse	Clarity
102.	, there → ; there, , and there, . There	Punctuation in compound/complex sentences	Correctness
103.	, and	Punctuation in compound/complex sentences	Correctness
104.	the splint	Determiner use (a/an/the/this, etc.)	Correctness
105.	a present, or the present	Determiner use (a/an/the/this, etc.)	Correctness
106.	fragement → fragment, fragments	Misspelled words	Correctness
107.	<i>In present case report, surgical management of mandibular angle fracture in partially edentulous with periodontally compromised teeth, using Vaccum splint for appropriate reduction of fractured fragement and intermaxillary fixation.</i>	Hard-to-read text	Clarity
108.	the presented	Determiner use (a/an/the/this, etc.)	Correctness
109.	patients → patients', patient's	Incorrect noun number	Correctness
110.	, patients	Punctuation in compound/complex sentences	Correctness

111.	patients oral → patients oral	Improper formatting	Correctness
112.	was → were	Faulty subject-verb agreement	Correctness
113.	, using	Punctuation in compound/complex sentences	Correctness
114.	a better, or the better	Determiner use (a/an/the/this, etc.)	Correctness
115.	and provide	Conjunction use	Correctness
116.	provide → provides	Faulty subject-verb agreement	Correctness
117.	<i>In such case using Vacuum Formed Splints was better choice as it reduces periodontal trauma, provide good maintenance of oral hygiene.</i>	Unclear sentences	Clarity
118.	a thermoforming, or the thermoforming	Determiner use (a/an/the/this, etc.)	Correctness
119.	the treatment	Determiner use (a/an/the/this, etc.)	Correctness
120.	inthe → in the	Misspelled words	Correctness

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43,959	6,715	513	26 min 51 sec	51 min 39 sec
characters	words	sentences	reading time	speaking time

Score



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Writing Issues

604	346	258
Issues left	Critical	Advanced

Plagiarism

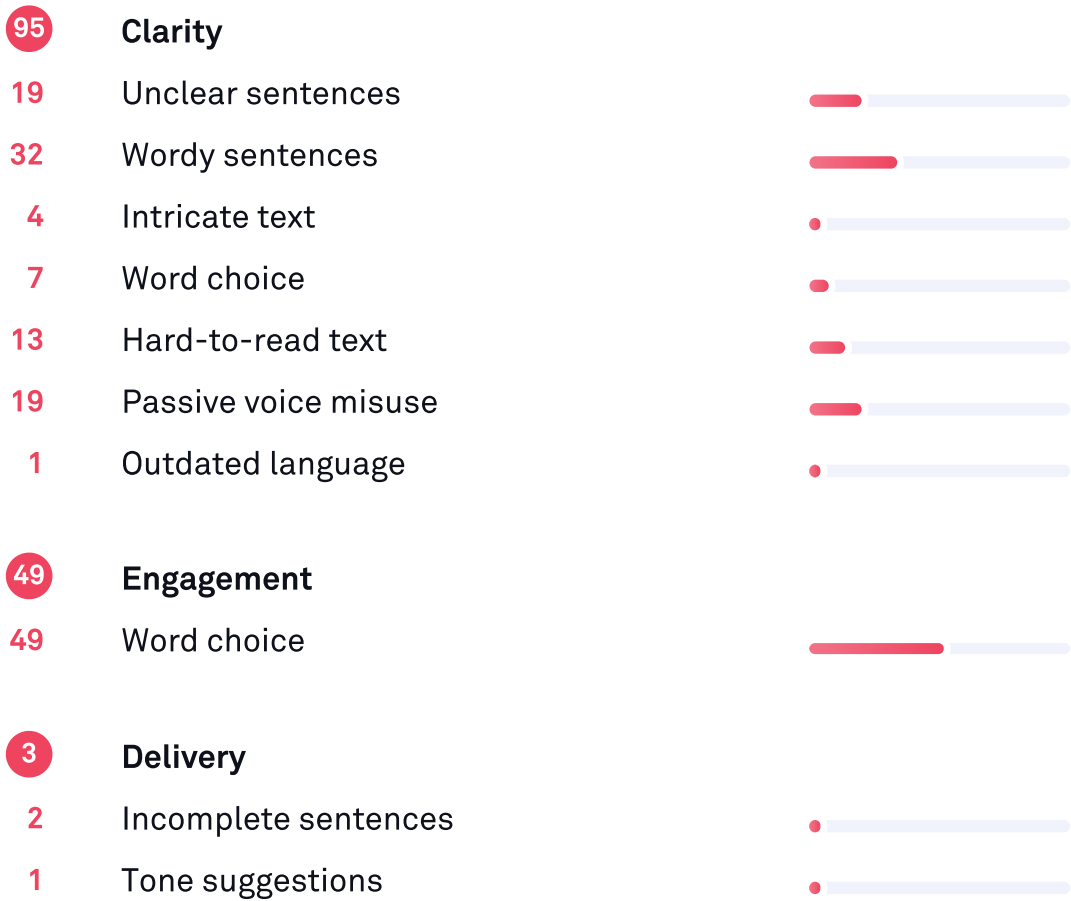


43
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Writing Issues

457	Correctness	
14	Faulty subject-verb agreement	
95	Determiner use (a/an/the/this, etc.)	
25	Comma misuse within clauses	
3	Text inconsistencies	
68	Punctuation in compound/complex sentences	
68	Misspelled words	
27	Incorrect verb forms	
31	Unknown words	
4	Misplaced words or phrases	
11	Wrong or missing prepositions	
5	Conjunction use	
8	Mixed dialects of english	
36	Improper formatting	
32	Incorrect noun number	
7	Pronoun use	
1	Citation style options	
4	Confused words	
7	Faulty tense sequence	
2	Misuse of quantifiers	
4	Closing punctuation	
1	Misuse of modifiers	
1	Incomplete sentences	
1	Modal verbs	
2	Misuse of semicolons, quotation marks, etc.	



Unique Words

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rare words

Word Length**4.7**

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Measures average sentence length

words per sentence

SYSTEMATIC REVIEW WRITE UP-after corrections

SYSTEMATIC REVIEW

COMPARATIVE EVALUATION OF ADVERSE EFFECT OF ZINC OXIDE EUGENOL AND CALCIUM HYDROXIDE IODOFORM PASTE AS ROOT CANAL FILLING MATERIAL IN PRIMARY TOOTH

INTRODUCTION

Dental caries imposes a negative influence on the dental and general health of the children in their early childhood (1),(2). Symptoms like sudden pain, particularly at night, pain when chewing, intraoral swelling or formation of an intraoral sinus tract may appear when caries enters the pulp (3), in that condition, preservation of tooth by root canal therapy/pulpectomy is foremost treatment. Root canal treatment (RCT) was first used in 1932 to save main teeth that would otherwise have been removed(4).

Pulpectomy primarily aims to obturate the disinfected endodontic space of primary teeth with an additional target such as root canal filling material to seal lateral as well as accessory canals providing hermatic seal and predictable treatment outcome.

Based on the ideal properties(5), the prime consideration while using obturating material for primary teeth is its inert and antimicrobial nature. However, such material being chemical in nature impose some adverse effects. Traditionally, the most common root canal filling material used is Zinc oxide eugenol(ZOE)(6). Bonstre was the first to discover Zinc oxide eugenol. Chisholm was the first to employed it in dentistry in 1876. Eugenol (4-Allyl-1,2-

dimethoxyphenol²⁴) is a pale yellow oily liquid phenolic⁽⁷⁾ and possesses antimicrobial properties⁽⁸⁾, analgesic and²⁵ anti-inflammatory properties⁽⁹⁾. However, there are some toxicities and adverse effects associated with this agent. To comprehend this toxicity²⁶, various mechanisms of action have been proposed like^{27,28} oxidative stress production (OS), particular cell plasma membrane lesions⁽¹⁰⁾⁽¹¹⁾, alteration²⁹ of ionic homeostasis⁽¹²⁾⁽¹³⁾. Similarly³⁰, the release of free eugenol molecules also³¹ been blamed for the toxicity³². Now³³ these toxicities were further modulated by the additives like zinc oxide. The combination thus achieved is ZOE which has numerous disadvantages like Slow resorption rate, injury to the periapical area, necrosis of bone and cementum and³⁴ deflection³⁵ of the permanent tooth bud off its route of eruption (14). The reports mentioned by Coll JA(1985) revealed the success rate of ZOE alone or in combination with fixative drugs such as formocresol³⁶ or iodoform ranges from 65 to 86 percent (14).

In 1920, Calcium hydroxide (Ca (OH)₂) was discovered. Its antibacterial activity is linked to ionic dissociation into Ca²⁺ and OH ions⁽¹⁵⁾. The rate of ionic dissociation determined by the vehicle utilised³⁷ in the formulation of the root canal filling paste plays an important³⁸ role in this process. Aqueous, viscous³⁹, and oily vehicles⁴⁰ are the most commonly used⁽¹⁶⁾. Pastes with an oily vehicle, particularly those with an antibacterial component (i.e., iodoform), have shown⁴ to be more effective than more soluble pastes when used as a root canal filling material in primary teeth⁽¹⁷⁾.

Iodoform has been added to Ca (OH)₂ due to its antibacterial effect, healing properties and ability to be resorbed when in excess⁽¹⁸⁾.⁴² The reported success rate for the combined Ca(OH)₂/iodoform paste ranges from 84% to 100%⁽¹⁹⁾.⁴³ Radiopacity, ease of insertion and removal from the canal, lack of influence on the succedaneous tooth and ability to be resorbed within 8 weeks once⁴⁴

extruded or forced past the apex are all benefits of iodoform^{46,47}(20). The main disadvantage of Ca(OH)₂/iodoform paste is a potential risk of intracanal resorption(Hollow tube effect)(21). Iodoform pastes are more resorbable(22) (23) and also cause a yellowish-brown⁴⁸ staining of the tooth crowns, which can be unsightly (24). Iodoform-containing root canal filling products comes in a variety⁵⁰ of formulations: Kripaste, Maisto paste, Guedes-Pinto paste, Rifocort, Endoflas and Vitapex⁴⁹ (calcium hydroxide and iodoform)(25).

Given the above-mentioned adverse effects of both ZOE and Calcium hydroxide/iodoform paste, it is necessary to compare the multiple adverse⁵¹ consequences of these two materials in order to⁵² determine which material is more biocompatible, safe for dental tissue⁵³, and suitable for use in dentistry for various dental procedures. There is no comprehensive systematic analysis that⁵ compares the numerous adverse consequences of Ca(OH)₂/Iodoform paste vs⁵⁵ Zinc oxide eugenol as a root canal filling material in primary teeth. As a result, the aim of this systematic review was⁵⁶ to assess and compare the adverse effects of Ca(OH)₂/Iodoform paste and Zinc oxide eugenol as root canal filling materials in primary teeth.

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OBJECTIVES

i) Primary objective

Evaluating the adverse effect of zinc oxide eugenol and calcium hydroxide iodoform paste as root canal filling material in primary tooth

ii)Secondary objective

Comparison of adverse effect of zinc oxide eugenol and calcium hydroxide iodoform paste as root canal filling material in primary tooth

METHODOLOGY

⁶⁰⁸ The Preferred Reporting Items for Systematic Reviews and Meta-Analysis statement [PRISMA] ⁵⁸ was used to write this study(26). With the registration number CRD42022297556, it was included ⁵⁹ into ⁶⁰ the international prospective ⁶¹ registry of systematic reviews.

3.1. Eligibility criteria

Studies that examined the adverse effects of Ca (OH)₂/iodoform against ZOE pulpectomy in primary teeth were considered eligible.

The inclusion criteria were-

- 1] Studies which include Zinc oxide eugenol or ZOE and Calcium hydroxide /Iodoform paste or Metapex or Vitapex
- 2] Age group- 3-13 years
- 3] Follow up ⁶² period- minimum of 6 months
- 4] Randomised controlled trial, In vivo and in vitro studies evaluating adverse ⁶³ effect such as Hollow tube effect, deflection of permanent successors, ³⁵ cytotoxicity, bond strength of restorative material, delayed root resorption, ⁶⁴ pathological root resorption, apical microleakage of root canal filling material.
- 5] In vitro studies including ⁶⁵ primary teeth

The exclusion criteria were as follows:

- 1] Cross-sectional, retrospective, laboratory, and animal studies, literature review.
- 2] Studies which were⁶⁶ not in english^{67,68} language
- 3] All studies investigating RCT in permanent tooth
- 4] Studies investigating pulpectomy in primary teeth without Succadaneous teeth
- 5] Age Group and follow up⁶⁹ period mentioned beyond the inclusion criteria
- 6] Any research whose study population included special needs patients.

3.2. Search strategy

All publications comparing the adverse effects of Ca(OH)₂/Iodoform versus ZOE as a root filling⁷⁰ material in primary teeth pulpectomy were found⁷¹ using search techniques. Metapex and Vitapex are two⁷³ commercial Ca(OH)₂/iodoform formulations that are currently prevail^{72,73} on the market. Hence, the following set of keywords were used^{74 75} during the search (zinc oxide eugenol OR ZOE) AND (Calcium hydroxide/Iodoform OR Vitapex OR Metapex) AND (root canal filling OR obturating material) AND (primary teeth OR deciduous teeth). We restricted our search to publications⁷⁶ published between 2001 and 2021, using publication year and language limitations. Our initial search was conducted in⁷⁷ january⁷⁸ 2022.⁷⁹ The titles of all studies were reviewed,⁸⁰ Duplicate⁸¹ studies were excluded.

3.3. Data extraction

Using a data extraction sheet,⁸² the reviewers next⁸³ independently collected data from the selected studies. Publication information (author and year), research

technique, site and ⁸⁴study design, number and age of children, number and type of teeth, presence of group and subgroups, ⁸⁵sample size in each group), follow-up period(s), ⁸⁶unfavourable outcomes and results were among the variables. In this systematic review, we defined adverse outcomes of Ca(OH)₂/iodoform paste and Zinc oxide eugenol as a root canal filling material in primary teeth.

3.4. Risk of bias

⁸⁷Risk of bias ⁸⁸of the ten included studies ⁸⁹were checked using the revised ⁹⁰cochrane risk-of-bias tool for ⁹¹randomised trials (RoB- 20). ⁹²In this, there were ⁹³5 ⁹⁴domains by which ⁹⁵risk of bias was assessed. ⁹⁶the 5 ⁹⁷domains ⁹⁸includes ⁹⁹risk of ¹⁰⁰bias arising from ^{101,102}randomisation process, ROB due to deviation from intended intervention (effect of assignment to intervention), due to ¹⁰³deviation from ¹⁰⁴intended intervention (¹⁰⁵effect of adhering to intervention), ROB due to missing outcome data, ROB in the measurement of outcome, ROB in the selection of reported result.

RESULTS

Study selection

¹⁰⁶Search strategy returned a total of 445 related titles (figure 1). ¹⁰⁷The titles of all ¹⁰⁸studies were reviewed, ¹⁰⁹Duplicate studies were excluded. Following the removal ⁶⁰⁹of duplicate studies (218) and studies that did not match the inclusion criteria, the complete text of 18 articles was obtained and compared to the ¹¹⁰criteria. We excluded eight studies as follows: Three studies were not in ¹¹⁰English language,

one study ¹¹¹ without comparison groups, one ¹¹⁵ study not fulfilled the follow up ¹¹² criteria ¹¹³ and three studies ¹¹⁴ full text not available. ¹¹⁵ Studies were excluded when it was obvious that the paper was not discussing any adverse outcomes of Ca(OH)₂/iodoform compared with ZOE in primary teeth pulpectomy. ¹¹⁶ The total ⁶¹⁰ number of ten studies were included ¹¹⁷ in this Systematic review.

Characteristics of the included studies

Ten studies in the presented Systematic review (Table 1) included 831 primary teeth (55 anterior teeth and 776 molars), ¹¹⁸ of children aged between 3 and 13 years, ¹¹⁹ pulpectomized ¹²⁰ and had follow-up period ¹²¹ ranged ¹²² from 2 (Ozalp, Saroglu, & Sonmez, 2005) to 30 months (Pramila et al., 2016). ¹²³ From these studies, eight included primary molars only (Al-Ostwani et al., 2016; Chen et al., 2017; Gupta & Das, 2011; Subramaniam & Gilhotra, 2011; ¹²⁴ ozalp et al., 2005; Pramila et al., 2016; Elbay et al., 2016; Brar et al., 2020;) and two studies included both ¹²⁵ primary ¹²⁶ incisors and molars (Mortazavi & Mesbahi, 2004; ¹²⁷ Bawazir et al.). ¹²⁸ Only the aforementioned Ca(OH)₂/iodoform products, Metapex and Vitapex, were used in these studies; Metapex was used in five studies (Al-Ostwani et al., 2016; ¹²⁹ Gupta & Das, 2011; Brar et al. 2020; Subramaniam & Gilhotra, 2011; ¹²⁷ Elbay et al.), whereas Vitapex was used in five studies (Chen et al., 2017; Mortazavi & Mesbahi, 2004; Ozalp et al., 2005; Pramila et al., 2016; Bawazir et ¹³⁰ al, 2007) ¹²⁷ ¹³¹ .

The included studies had different eligibility criteria as well as different study methodologies. Variations were present in the number of ¹³² childrens included in the study, ¹³³ number of treatment visits, the latency to follow-up examination ¹ and various adverse outcomes of root canal filling material (Table 1).

Ca(OH)₂/iodoform paste was compared ¹³⁵ with ZOE in four studies (Gupta & Das, 2011; ¹³⁶ ; Mortazavi & Mesbahi, 2004; Elbay et al. 2016 ¹³⁷ ; Ozalp et al., 2005) ¹³⁸ ¹³⁹ , ¹²⁷ ¹⁴⁰ .

¹⁴¹
 ZOE and ZOE/iodoform combined with Ca(OH)₂ in four studies (Al-Ostwani et al., 2016; Chen et al., 2017; Subramaniam & Gilhotra, 2011; Brar et al.2020),¹²⁷
 611 | ZOE and ZOE/iodoform in one study (Pramila et al., 2016).
 The aim of this Systematic review was to compared and evaluate¹⁴² adverse effect¹⁴³ of Zinc oxide eugenol and Calcium hydroxide/iodoform paste as a obturating¹⁴⁴ material for primary tooth.¹⁴⁷ So various adverse outcomes such as Hollow tube¹⁴⁸ effect, deflection of permanent,¹⁴⁹ successors, cytotoxicity, bond strength of¹⁵⁰ restorative material, delayed root resorption, pathological root resorption,¹⁵¹ apical microleakage of root canal filling material were included in this¹⁵² systematic review for comparison.¹⁵³
 Amongst all studies, five studies compared the hollow tube effect (Al-Ostwani et al., 2016; Subramaniam & Gilhotra, 2011; Mortazavi & Mesbahi, 2004; Brar et al., 2020; Chen et al., 2017),¹²⁷ three studies compared the pathological¹⁵⁴ resorption of root (Ozalp et al., 2005; Subramaniam & Gilhotra, 2011; Pramila et al., 2016),¹²⁷ three studies compared the deflection of permanent tooth bud from¹⁵⁵ their original path of eruption (Chen et al., 2017; Mortazavi & Mesbahi, 2004;Pramila et al., 2016),¹⁵⁶ one study showed the necrosis of bone and¹²⁷ cementum i.e. cytotoxicity (Gupta & Das, 2011),¹⁵⁷ one study showed the apical¹²⁷ microleakage of root canal filling material (Bawazir et al, 2007),¹⁵⁸ one study¹⁵⁸ showed the effect of root canal filling material on the bond strength of¹⁵⁸ restorative material (Elbay et al.,2016),¹²⁷ three studies showed the delayed root¹²⁷ resorption (Al-Ostwani et al., 2016; ; Brar et al., 2020; Chen et al., 2017).¹⁵⁹
 612 |

Identification

Pubmed-243

Google scholar-¹⁶⁰ 119

EBSCO host - 71

Cochrane- 11

Additional records identified through other sources

[n=1]

Records identified through database searching [n= 444]

Records after duplicates removed-[n=227]

Screening

Records excluded

[n= 209]

Records screened

[n=227]

8 Studies excluded[n=08]-

studies are not in english^{161,162} language [n=3]

study¹⁶³ not fulfilled the follow up¹⁶⁴ criteria[n=1]

study without comparison groups [n=1]

studies full text not available [n=3]

:

Eligibility

Full text¹⁶⁵ articles assessed for eligibility

[n=18]

Included

⁶¹³ | Studies included in the qualitative synthesis [n=10]

FIGURE 1- PRISMA Flow diagram depicting study selection criteria

Hollow tube effect^{166,167} which was compared in five studies effect (Al-Ostwani et al.,¹⁶⁸ 2016; Subramaniam & Gilhotra, 2011; Mortazavi & Mesbahi, 2004; Brar et al.,¹⁶⁹ 2020; Chen et al., 2017)^{127 170} . Out of these five studies, in two study¹⁷¹ (Subramaniam & Gilhotra, 2011; Mortazavi & Mesbahi, 2004) both ZOE and^{127 172} metapex/vitapex not showed hollow tube effect whereas, in other three studies^{173 174} (Al-Ostwani et al., 2016; Brar et al., 2020; Chen et al., 2017) hollow tube effect^{127 175} only showed by Metapex/Vitapex .^{177,178}

In three studies (Ozalp et al., 2005; Subramaniam & Gilhotra, 2011; Pramila et al., 2016),¹²⁷ the pathological resorption of roots were compared, study^{179 180} by Ozalp et al.,2005 showed that At 2,4, 6, 8,10,12 and 18¹⁸¹ month follow up, both ZOE and metapex/vitapex^{182 183} did not showed¹⁸⁴ pathological root/bone resorption. Study by^{185,186}

Subramaniam & Gilhotra, 2011 showed that at 3 months, only ZOE show pathological resorption of root and at 6,12 and 18 months no pathological resorption seen for both ZOE and metapex/vitapex. The study conducted by Pramila et al., 2016 ; showed that the External root resorption is highest in vitapex followed by ZOE whereas None of the material showed internal root resorption at any follow up visits.

Three studies (Chen et al., 2017; Mortazavi & Mesbahi, 2004;Pramila et al., 2016) compared, the deflection of permanent tooth bud from their original path of eruption as adverse effect of root canal filling material. In the study conducted by Mortazavi & Mesbahi, 2004, after 3 months of follow up, ZOE and vitapex showed no deflection but after 10-16 months of follow up only ZOE showed deflection. The study by Chen et al., 2017 showed that the at 18 months follow up only, ZOE caused Deflection of permanent tooth bud whereas in study by Pramila et al., 2016 both material in the study caused no deflection in the original path of eruption of the permanent tooth bud. In the study conducted by Gupta & Das in 2011, cytotoxicity of obturating material which ultimately results in necrosis of bone and cementum compared amongst the ZOE and metapex and showed that the ZOE was more cytotoxic than Metapex.

The apical microleakage of root canal filling material which was evaluate and compared in the study conducted by Bawazir et al. in 2007 and presented the result as follows- the highest apical microleakage showed by ZOE followed by vitapex. Apical microleakage evaluated using the penetration of dyes in the root canals.

614 | The study by Elbay et al. in 2016 compared the effect of root canal filling material on the Bond strength [BS] of restorative system and found that the root canal filling material reduced the bond strength of restorative system. The

study ²³⁹ point out that ²⁴⁰ amongst both root canal filling material used, ZOE reduced more bond strength of ^{241,242} restorative system ²⁴³ than ²⁴⁴ metapex. ^{245,246}

Study

Site and study design

Subjects [no. of ²⁴⁷ childrens, no. of teeth]

Follow up in months

Age of the patient

[years]

Group

Sample size [N]

Outcomes assessed

[adverse effects]

Results

Mortazavi and Mesbahi [2004]

Not mentioned, Iran RCT

58 Patients

58 primary teeth: 53 maxillary and mandibular primary molars and ²⁴⁸ 5 ²⁴⁹ primary anterior

3,
10–16

3–13yrs

ZOE [N= 32],
Vitapex [N=26]

Deflection of permanent successors, Hollow tube effect

After ²⁵⁰3 months, none of ²⁵¹material showed ^{35,252}deflection of permanent successors

After 10 -16 months, ZOE showed ³⁵deflection in 2 patients.

None of ^{253,254}material showed ²⁵⁵Hollow tube effect.

Ozalp et al. [2005]

University, Turkey RCT [single blinded]

76 patients

40 primary molars Maxillary and mandibular primary molars: 1st and 2nd molars

2,4,6

8,10,12

18

4–9yrs

ZOE [N= 20],

Vitapex [N=20], sealapex²⁵⁶ [N=20], Calcicur [N=20]

pathological root/ bone resorption

At 6²⁵⁷ month follow up²⁵⁸, only sealapex²⁵⁹ and Calcicur showed pathological root resorption. At 2,4,8,10,12 and 18 month²⁶⁰ follow up, none of the material showed pathological root/bone resorption²⁶¹

Bawazir et al. [2007]

King ²⁶²saud university, ²⁶³Saudi ²⁶⁴arabia

In vitro, ²⁶⁵RCT

50 primary anterior teeth

-

-

ZOE [N= 10],

vitapex [N=10]

Kri paste [N=10]

Ca [OH]2 [N=10]

PC [N=5]

NC [N=5]

Apical microleakage of root canal filling material

Highest apical microleakage in descending order as follows- ZOE> ca[OH]2 >KRI
paste> vitapex

Subramaniam and Gilhotra [2011]

College, hospital, and research center, Bangalore RCT

²⁶⁶
Number of patients not mentioned

45 primary teeth: 5 maxillary, 40 mandibular Primary ²⁶⁷ molars: 1st and 2nd molars

²⁶⁸
3,6,12, 18

5–9yrs

ZOE [N= 15],

Metapex [N=15},

Endoflas [N=15]

Pathological resorption of root, hollow tube effect

At ²⁶⁹3 months, only ZOE ²⁷⁰show pathological resorption of ²⁷¹root,

At ²⁷²6,12 and ²⁷³18 months no pathological resorption ²⁷⁴seen for any of the ²⁷⁵material.

No hollow tube effect showed by any of the ²⁷⁶material.

Gupta and Das [2011]

University, Kolkata, India CT

34 patients

42 primary mandibular molars

3, 6

4–7 yrs

ZOE [N= 21],

Metapex [N=21]

Necrosis of bone and cementum

[cytotoxicity]

Study shows ZOE ²⁷⁷ more cytotoxic than Metapex ²⁷⁸ .

Al-Ostwani et al. [2016]

University, Damascus, Syria RCT [double blinded]

39 patients

64 primary molars

6,12

3–9 yrs

ZOE [N= 16],

Metapex [N=16],

Endoflas [N=16]

Zinc oxide and propolis[ZOP] [N=16]

Delayed root resorption, Hollow tube effect

Delayed root resorption-ZOE> endoflas²⁷⁹ CF= Metapex >ZOP.

Hollow²⁸⁰ tube effect only showed by metapex, other²⁸¹ 3²⁸² materials²⁸³ not showed²⁸⁴
this effect.

Pramila et al. [2016]

College and hospital, India RCT [double blinded]

88 patients

129 primary mandibular molars

1st and 2nd molars

6, 12, 30

4–9yrs

ZOE [N= 43],

Vitapex [N=43]

Rc fill[N=43]

Deflection in path²⁸⁵ of succadaneous²⁸⁶ tooth eruption, internal and external root resorption

No deflection in succadaneous²⁸⁷ tooth eruption showed by any of the material²⁸⁸.

None of the material showed internal root resorption at any follow up ²⁸⁹ visits
whereas

External root resorption is highest in vitapex ^{290,291} followed by RC fill ²⁹² followed by ZOE ²⁹³ ²

Elbay ²⁹⁵ et al.

[2016]

Selcuk university,turkey ²⁹⁶ ²⁹⁷

In vitro, RCT

90 extracted primary second molar

-

-

Control group without sealer [N= 30],

Metapex [N=30],

Cavex ZOE [N=30]

Bond strength [BS] of restorative ²⁹⁸ system

Decreased BS of restorative material – ZOE > Metapex > control group ²⁹⁹

Chen et al. [2017]

University, China RCT [double blinded]³⁰⁰

158 patients

163 primary molars Maxillary and Mandibular: 1st and 2nd primary molars

6, 12,18

4–9 yrs

ZOE [N= 51],

Vitapex [N=56],

MPRCF [N =53]

Hollow tube effect, Deflection³⁵ of permanent successors, Delayed root resorption

Hollow tube effect- only

Vitapex,

Showed hollow tube effect, no effect Showed by ZOE and MRPCF

Deflection of permanent successors - at 18 months,³⁰¹ only³⁰² ZOE caused

Deflection³⁰³ of permanent tooth bud.

At 18 months³⁰⁴ ZOE showed delayed root resorption whereas³⁰⁵ other2³⁰⁶ material³⁰⁷ didn't show.^{308,309}

Brar et al.[2020]

Punjab,India³¹⁰

RCT

(single blinded)³¹¹

150 infected primary molar,75 healthy children

6

12

3-7 yrs

ZOE [N= 50],
 Metapex [N=50],
 Endoflas [N=50]

Hollow tube effect and Delayed root resorption

Hollow tube effect showed by metapex³¹² only after the follow up³¹³ of 6 -12 months.
 At 6 & 12month- only ZOE delayed the root resorption compares³¹⁴ to Endoflas
 And Metapex³¹⁵

CT- controlled trial, RCT - Randomised controlled trial, ZOE -zinc oxide eugenol,
 MPRCF- mixed primary root canal filling, PC -positive control³¹⁶, NC -negative control

In these three studies (Al-Ostwani et al., 2016; ; Brar et al., 2020; Chen et al., 2017)¹²⁷ which compared delayed root resorption, in two studies (Brar et al., 2020; Chen et al., 2017), only ZOE showed delayed root resorption but vitapex³¹⁸ did not showed³²⁰ delayed root resorption. In one study (Al-Ostwani et al., 2016)^{127 321} -
 delayed root resorption showed by both ZOE as well as³²² Metapex, it was found³²³
 that later material delayed³²⁵ the root resorption but less compared to ZOE.³²⁴

Quality assessment

Ten of the included studies were randomized clinical trials (Al- Ostwani et al., 2016; Chen et al., 2017 Mortazavi & Mesbahi, 2004; Ozalp et al., 2005; Pramila³²⁶

et al., 2016; Subramaniam & Gilhotra, 2011; Elbay et al.2016; Gupta & Das, 2011; Bawazir et al, 2007; Brar et al., 2020). three of them were double-blinded (Al-Ostwani et al., 2016; Chen et al., 2017; Pramila et al., 2016), and two was single-blinded (Ozalp et al., 2005; Brar et al., 2020). only two studies were determined to have low risk of bias {figure 2} (Brar et al.,2020; Pramila et al., 2016; high quality), five studies were shown to have a moderate risk of bias (Al-Ostwani et al., 2016; Chen et al., 2017; Mortazavi & Mesbahi, 2004; Ozalp et al., 2005; Subramaniam & Gilhotra, 2011), three studies were considered to have a high risk of bias (Gupta & Das, 2011; Bawazir et al, 2007; Elbay et al.2016) .

The moderate-quality studies most often received lower scores due to an omission of sample size, an unclear design of the study, and lack of randomization implementation. Similarly, the low-quality studies scored poorly in multiple categories for a variety of reasons, including unclear study design, lack of randomization implementation, failing to randomize subjects upon study administration despite having proposed randomization, lack of blinding, and lack of inter-operator reliability. High quality studies means low risk bias studies provided a less detailed explanation of the outcome measure.

DISCUSSION

Use of biomaterials with high compatibility with surrounding tissues and close resemblance to the physical, chemical, and biological characteristics of dental tissues has been followed currently in restorative dentistry. Endodontic therapy has been developed in early 20th century to save primary teeth(27). The main goal of a root canal treatment is to prevent re-infection of the root canal due to the release of microorganisms and their by-products. The treatment outcome may be influenced by the of root canal fillings(28). The first root canal filler material recommended was ZOE. It has been stated that it has a variety of therapeutic characteristics, including analgesic and anti-inflammatory

properties. But there are ^{352,353} certain associated toxicities and adverse effects of this material ^{354,355} thats why there is ³⁵⁶ need to ³⁵⁷ introduced the material ³⁵⁸ which has better properties than ZOE and has ^{359,360} less ³⁶¹ adverse ^{362,363} effect. One such material is calcium hydroxide/iodoform paste or ^{364,369} metapex or ³⁶⁵ vitapex ³⁶⁶ which is better than ZOE in ³⁶⁷ their properties and ³⁶⁸ less adverse effects. ³⁷⁰ There are various systematic review ³⁷¹ which evaluate and ³⁷² compared the clinical and radiographic success of ^{373,374} this two ³⁷⁵ material. ³⁷⁶

FIG 2 – Showing quality assessment of studies included in ³⁷⁷ systematic review

?

Sr. no.

Studies

ROB arising from ^{378,379} randomisation process

ROB due to deviation from ³⁸⁰ intended variation

[effect of assignment to intervention]

ROB due to deviation from ^{381,382} intended variation

[³⁸³ effect of adhering to intervention]

ROB due to missing outcome data

ROB in ³⁸⁴ measurement of the outcome

ROB in ³⁸⁵ selection of reported result

Overall bias

1.

Al-ostwani et al. [2016]

?

+

+

+

+

+

?

2.

Chen et al. [2017]

+

?

+

+

?

?

3.

Mortazavi and mesabahi³⁸⁶ [2004]

?

+

+

+

+

+

?

4.

Ozalp et al. [2005]

?

+

+

+

+

+

+

?

5.

Pramila et al. [2016]

+

+

+

+

+

+

+

6.

Subramaniam and Gilhotra et al. [2011]

?

+

+

?

+

+

?

7.

Gupta and Das [2011]

?

-

-

-

+

+

-

8.

Bawazir et al. [2007]

?

+

-

+

+

+

-

9.

³⁸⁷
Elbay et al. [2016]

?

-

+

-

+

-

10.

Brar et al. [2020]

+

+

+
+
+
+
+
+

Where,

ROB- Risk of bias,

³⁸⁸Red circle with negative sign- ³⁸⁹High risk study,

³⁹⁰Green circle with positive sign – ³⁹¹Low risk study,

³⁹²Yellow circle with question mark- Study with some concern

In this systematic review, various adverse outcomes of this two ³⁹³materials compared ³⁹⁴such as ³⁹⁵Hollow tube effect, ³⁹⁶deflection of permanent, ³⁵successors, cytotoxicity, bond/adherence strength of restorative material, delayed root resorption, pathological root resorption and apical microleakage of root canal filling material in between the Ca (OH)₂/iodoform and ZOE. ³⁹⁸

This systematic review was the first ³⁹⁹ever to compare the multiple adverse outcomes of Ca(OH)₂/iodoform and ZOE used in primary teeth pulpectomy as a root canal filling material. This systematic review included ten studies ⁴⁰⁰all of which are ⁴⁰¹randomised ⁴⁰²controlled ⁴⁰³trial.

The capacity to resorb at the same rate as the root should be one of the qualities of an ideal root canal filling material for a primary tooth. Metapex has been shown to resorb at a far faster rate than the root, providing well-obtured root canals ⁴⁰⁴the appearance of a "hollow tube." ⁴⁰⁵Amongst all studies, five ⁴⁰⁶studies compared the hollow tube effect (Al-Ostwani et al., 2016; Subramaniam & Gilhotra, 2011; Mortazavi & Mesbahi, 2004; Brar et al., 2020; Chen et al., 2017).¹²

The result of ⁴⁰⁷study conducted by Mortazavi & Mesbahi, 2004 is similar to

Subramaniam & Gilhotra ⁴⁰⁸ study ⁴⁰⁹ in which both of the material ⁴¹⁰ i.e. ⁴¹¹ ZOE and calcium hydroxide iodoform not showed ⁴¹² any hollow tube effect. Whereas in the other three study ^{414,415} by Al-Ostwani et al., 2016; Brar et al., 2020 and Chen et al., 2017 metapex/vitapex ⁴¹⁶ showed ⁴¹⁷ hollow tube effect ⁴¹⁸ but ⁴¹⁹ ZOE did not showed ^{420,421} this effect. The explanation for this could be the key ⁴²² ingredient Calcium hydroxide, which, despite its antibacterial and osteoinductive characteristics, has a propensity ⁴²³ to deplete from the canals before the physiologic resorption of the roots(29),(30). Early metapex/vitapex ⁴²⁴ resorption ⁴²⁵ creates a narrow route for bacterial development, resulting in re-infection of the root canal (23). One of the optimal ⁴²⁶ properties of root canal filling material is resorption when extruded past the apex of the tooth into the periradicular ⁴²⁷ area. When ZOE is extruded into periradicular ⁴²⁸ tissue, however, it resorbs slowly. Due to ZOE's slow resorption and its particles' resistance to giant cells, significant amounts of eugenol ²² produced from the residual ZOE may influence the surrounding tissue, delaying the healing process. Due to this delay in healing process ⁴²⁹ the ⁴³⁰ resorption of root ⁴³¹ is also get ⁴³⁷ affected ^{432,433,437} results ⁴³⁴ in delayed root resorption which ⁴³⁵ affects overall ⁴³⁶ surrounding tissue and succedaneous ⁴³⁸ tooth bud(29). three ⁴³⁹ studies included in this systematic review compared delayed root resorption as adverse ⁴⁴⁰ outcome ⁴⁴¹ amongst the ZOE and Calcium hydroxide/Iodoform. Only ZOE showed delayed ⁴⁴² root resorption in tw ⁴⁴³ (Brar et al., 2020; Chen et al., 2017) ¹²⁷ of the three investigations. Delayed root resorption was showed ⁴⁴⁴ by both ZOE and Metapex in one study (Al Ostwani et al., 2016). It was found that later material delayed root resorption but less than ZOE.

Amongst the ideal properties of root canal filling material, one of the property ⁴⁴⁴ is when the material is pressed beyond the apex of tooth ^{445,446} it should not set to a hard mass which could deflecting ^{447,450} an erupting succadaneous ⁴⁴⁸ tooth(31),⁴⁴⁹ (32). In ⁴⁵¹ case of ZOE, Many reports have stated that slow resorption of this cement in

canals, when forced or pressed beyond the apex, forms a hard mass, and as a result, there is a risk of deflection of erupting succedaneous teeth due to its hardness (33). The essence of ZOE production, according to one theory, is the reaction of eugenol with bivalent zinc ions to create insoluble chelation, which wraps remanent zinc oxide in it and forms a solid mass. In contrast to ZOE, calcium hydroxide iodoform is easier to resorb from the periapical area, has no foreign body reaction, and does not deflect the erupting succadaneuos tooth. The reaction time is shorter and the product degrades quickly due to the decreased chelation strength and high solubility of calcium hydroxide. Second, iodoform dissolves quickly when it comes into touch with solutions or tissue fluid, causing the filling mass to become porous and loose, making it easier to resorb.(21).

In our study, three of the ten included studies compared the deflection of erupting succadaneous tooth as a adverse outcome amongst the ZOE and calcium hydroxide iodoform. In a study conducted by Mortazavi & Mesbahi in 2004, ZOE and vitapex exhibited no deflection after 3 months of follow up, however only ZOE showed deflection after 10-16 months of follow up. Chen et al., 2017 discovered that ZOE produced permanent tooth bud deviation only after 18 months of follow-up, however Pramila et al., 2016 discovered that both materials in the study caused no deflection in the permanent tooth bud's initial course of eruption.

One of the criteria for ideal root canal filling material for primary teeth is its sealing ability. It's critical that the root canal filling materials have appropriate sealing characteristics. since inadequate seal at the apex leads to failures of root canal therapy as well as pulpectomy treatment in primary teeth. In

616 permanent teeth, The cement fills the spaces between the obturation material and the root canal walls. When pressure and condensation are applied to the

core material during root canal obturation in permanent teeth, cement and gutta percha⁴⁷⁵ adapt better and closer to the root canal walls. This condition does not exist in primary teeth, which use a paste as a sole obturation material. Therefore, the sealing ability of the material used to fill a root canal in primary teeth depends mainly on the material's ability to adhere to the root canal walls and the method applied to introduce this material into the root canal. Therefore, there is^{476,480} more chances⁴⁷⁷ of apical microleakage in primary tooth⁴⁷⁸ compared to⁴⁸⁰ permanent tooth⁴⁷⁹. Only single⁴⁸¹ study by Bawazir et al.2007 included⁴⁸² in this systematic review compared apical microleakage of root canal filling⁴⁸³ material in primary tooth and reported that for ZOE group there was a high^{484,485} apical microleakage than vitapex group due to shrinkage of this material after⁴⁸⁶ setting.

617 | Root canal sealers have an impact on⁴⁸⁷ the capacity of restorative⁴⁸⁸ systems to adhere to the pulp chamber dentin of permanent teeth. There was no⁴⁹³ research into the influence of root canal sealers on restorative system⁴⁸⁹ microtensile bond⁴⁹⁰ strength (uTBS)⁴⁹¹. In this systematic review, we included a study published in 2016 by Elby et al., which looked at the effect of endodontic sealers on the binding strength of restorative⁴⁹⁴ systems to primary tooth pulp chamber dentin. Root canal sealers dramatically impaired the bonding ability of restorative^{495,496} systems⁴⁹⁷, according to the findings of this study. All three restorative^{498,499} systems' uTBS values were considerably lowered by metapex⁵⁰⁰ and cavex⁵⁰¹ ZOE (P< 0.05). There were no significant differences between the three restorative^{502,503} systems in the Metapex and Cavex ZOE groups (P>0.05). Additionally, both⁵⁰⁴ Metapex and Cavex ZOE affected the uTBS of restorative⁵⁰⁵ systems⁵⁰⁶ similarly (P>0.05). It was⁵⁰⁷ reported⁵⁰⁸ that ZOE may affect bonding in two ways: first, the remnant material in dentin may affect the bonding process, and second, after the hardening reaction was completed, exposure to water causes hydrolysis of the material

619 and release of eugenol²², thus preventing polymerization of adhesive materials. The decrease in bond strength due to ZOE in the present study may be attributed to one of these two⁵⁰⁹ reasons. When it comes to metapex⁵¹⁰, The bonding ability of the leftover material was most likely diminished as a result of the⁵¹¹ remnant material. When exposed to adhesive material primers including⁵¹² ethanol and acetone, Metapex may disintegrate, lowering bond strength. Tooth resorption can be a physiological or pathological process that occurs internally (pulpally⁵¹³ derived) or externally (periodontally derived). Resorption is defined as a condition characterised⁵¹⁴ by the loss of dentin, cementum, or bone as a result of a⁵¹⁵ physiologic or pathologic event(34). External resorption begins from the external⁵¹⁶ or cervical surface of the tooth and proceeds⁵¹⁷ inwards and Internal resorption (IR) is a rare, insidious, resorptive pathological process, beginning⁵¹⁸ in the pulpal space and extending into the surrounding dentin. Internal resorption is noticed in the inner walls of root canal⁵¹⁹ while⁵²⁰ external resorption is noticed⁵²¹ on the root surface or cervical area. External root resorption exists concurrently with resorption of the alveolar bone and the⁵²² resorptive process presents in a similar manner⁵²³ to that of bone. There are three studies in this systematic review which compared the the pathological⁵²⁴ resorption of roots. Result of the study^{526,527} conducted by ozalp et al.⁵²⁸ in 2005⁵²⁹ corresponding to study⁵³¹ by Subramaniam & Gilotra, 2011 reported that At 6,12 and 18 month follow up⁵³², both ZOE and metapex/vitapex⁵³³ did not showed⁵³⁴ pathological root/bone resorption. But in Subramaniam & Gilotra, 2011 study At⁵³⁸ 3 months⁵³⁹, only ZOE show pathological resorption of root^{540,541}. Another study⁵⁴² by Pramila et al., 2016 in which⁵⁴⁹ the external and internal root resorption which⁵⁴⁹ was pathological in nature⁵⁴³ and showed that the External root resorption is⁵⁴⁴ highest in vitapex^{545,546} followed by ZOE⁵⁴⁷ whereas, None of the material showed internal root resorption at any follow up⁵⁴⁸ visits.

Biocompatibility is one of the most important feature of root canal sealers, as these materials come into direct contact with periradicular tissues. This biocompatibility refers to the ability to elicit an adequate host response in a specific application; that is, it does not cause an undesirable reaction when it comes into touch with tissue (35),(36). However, all sealers have a certain level of toxicity, especially when first mixed, even though the toxicity decreases with setting (37). Therefore, sealer penetration into periradicular tissues should be averted. If sealer inadvertently pressed or pushed beyond the apex there may be chance of this sealer producing cytotoxicity causing the necrosis of bone and cementum. In the study conducted by Gupta & Das in 2011, cytotoxicity of two root canal filling material compared with one another and found that the ZOE was more cytotoxic than Metapex. Various molecular pathways for eugenol's cytotoxicity have been hypothesised, including oxidation by peroxidase enzymes to a substance hazardous to periradicular tissue (38), Eugenol were shown to have a high affinity for plasma membranes because of their lipid solubility(39) this contribute to causing cell damage, eugenol can uncouple oxidative phosphorylation in mitochondria(40).

LIMITATION OF THE STUDY

Amongst all studies, Only one study with longer follow up period (Pramila et al.2016- 30 months) was included in this systematic review. In other included studies follow up period was maximum of 18 months.

Three studies (Gupta & Das, 2011; Bawazir et al, 2007; Elbay et al.,2016) with only single adverse effect were included in this systematic review. Whereas in other studies two or more than two adverse effects were compared.

CONCLUSION

In this study, the various adverse outcomes were compared among the ZOE and Calcium hydroxide/Iodoform when used as root canal filling material in primary ⁵ tooth. ⁵⁸¹ On the basis of the ⁵⁸² current study findings, we believe that Zinc oxide eugenol showed more adverse effects than Calcium hydroxide/iodoform and ⁵⁸³ most of this ⁵⁸⁶ adverse ⁵⁸⁶ effects ^{584,585} of ZOE are Due to its delayed resorption. These ⁵⁸⁷ is the reason that it is not to be used for pulpectomy in primary teeth nearing exfoliation. Whereas, Ca(OH)₂/iodoform showed fast resorption as compared to ZOE that's ⁵⁸⁹ why the best filling material to be used for pulpectomy in primary teeth nearing exfoliation.

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1.	imposes → impose	Faulty subject-verb agreement	Correctness
2.	the children	Determiner use (a/an/the/this, etc.)	Correctness
3.	<i>Dental caries imposes a negative influence on the dental and general health of the children in their early childhood (1),(2).</i>	Unclear sentences	Clarity
4.	a sudden	Determiner use (a/an/the/this, etc.)	Correctness
5.	, or	Comma misuse within clauses	Correctness
6.	enters → enter	Faulty subject-verb agreement	Correctness
7.	pulp; Pulp	Text inconsistencies	Correctness
8.	,in → ; in, . In	Punctuation in compound/complex sentences	Correctness
9.	the tooth	Determiner use (a/an/the/this, etc.)	Correctness
10.	foremost → star, initial, only	Word choice	Engagement
11.	the foremost	Determiner use (a/an/the/this, etc.)	Correctness
12.	first	Wordy sentences	Clarity
13.	main → primary, central, prominent	Word choice	Engagement
14.	main → primary	Word choice	Engagement
15.	as well as → and	Wordy sentences	Clarity
16.	a hermatic	Determiner use (a/an/the/this, etc.)	Correctness
17.	hermatic → hermetic, hermitic	Misspelled words	Correctness

18.	inert → static	Word choice	Engagement
19.	in nature	Wordy sentences	Clarity
20.	nature,	Punctuation in compound/complex sentences	Correctness
21.	used	Wordy sentences	Clarity
22.	eugenol; eugenol's; Eugenol	Text inconsistencies	Correctness
23.	employed → employ	Incorrect verb forms	Correctness
24.	4-Allyl-1,2-dimethoxyphenol	Unknown words	Correctness
25.	, and	Comma misuse within clauses	Correctness
26.	To comprehend this toxicity	Misplaced words or phrases	Correctness
27.	like → including	Wrong or missing prepositions	Correctness
28.	, like	Punctuation in compound/complex sentences	Correctness
29.	and alteration	Conjunction use	Correctness
30.	Similarly → ¶ Similarly	Intricate text	Clarity
31.	has also	Incorrect verb forms	Correctness
32.	the toxicity	Determiner use (a/an/the/this, etc.)	Correctness
33.	Now,	Comma misuse within clauses	Correctness
34.	, and	Comma misuse within clauses	Correctness
35.	deflection; Deflection	Text inconsistencies	Correctness
36.	formocresol	Unknown words	Correctness
37.	utilised → utilized	Mixed dialects of English	Correctness

38.	an important → an essential, a vital	Word choice	Engagement
39.	viscous → dense	Word choice	Clarity
40.	vehicles → cars	Word choice	Engagement
41.	been shown	Incorrect verb forms	Correctness
42.	, and	Comma misuse within clauses	Correctness
43.	<i>Iodoform has been added to Ca (OH)₂ due to its antibacterial effect, healing properties and ability to be resorbed when in excess(18).</i>	Intricate text	Clarity
44.	, and	Punctuation in compound/complex sentences	Correctness
45.	8 → eight	Improper formatting	Correctness
46.	<i>Radiopacity, ease of insertion and removal from the canal, lack of influence on the succedaneous tooth and ability to be resorbed within 8 weeks once extruded or forced past the apex are all benefits of iodoform(20).</i>	Intricate text	Clarity
47.	<i>Radiopacity, ease of insertion and removal from the canal, lack of influence on the succedaneous tooth and ability to be resorbed within 8 weeks once extruded or forced past the apex are all benefits of iodoform(20).</i>	Hard-to-read text	Clarity
48.	a yellowish-brown	Determiner use (a/an/the/this, etc.)	Correctness
49.	, and	Comma misuse within clauses	Correctness
50.	<i>Iodoform-containing root canal filling products comes in a variety of</i>	Unclear sentences	Clarity

formulations: Kripaste, Maisto paste, Guedes-Pinto paste, Rifocort, Endoflas and Vitapex (calcium hydroxide and iodoform)(25).

51.	adverse → negative	Word choice	Engagement
52.	in order to → to	Wordy sentences	Clarity
53.	tissue,	Punctuation in compound/complex sentences	Correctness
54.	<i>There is no comprehensive systematic analysis that compares the numerous adverse consequences of Ca(OH)₂/Iodoform paste vs Zinc oxide eugenol as a root canal filling material in primary teeth.</i>	Unclear sentences	Clarity
55.	vs.	Comma misuse within clauses	Correctness
56.	this systematic review aimed	Wordy sentences	Clarity
57.	effect → effects	Incorrect noun number	Correctness
58.	<i>The Preferred Reporting Items for Systematic Reviews and Meta-Analysis statement [PRISMA] was used</i>	Passive voice misuse	Clarity
59.	<i>it was included</i>	Passive voice misuse	Clarity
60.	into → in	Wrong or missing prepositions	Correctness
61.	prospective international	Misplaced words or phrases	Correctness
62.	Follow up → Follow-up	Misspelled words	Correctness
63.	effect → effects	Incorrect noun number	Correctness
64.	<i>4] Randomised controlled trial, In vivo and in vitro studies evaluating adverse effect such as Hollow tube effect, deflection of permanent</i>	Hard-to-read text	Clarity

successors, cytotoxicity, bond strength of restorative material, delayed root resorption, pathological root resorption, apical microleakage of root canal fillin...

65.	, including	Punctuation in compound/complex sentences	Correctness
66.	which were → that were	Pronoun use	Correctness
67.	english → English	Misspelled words	Correctness
68.	the english	Determiner use (a/an/the/this, etc.)	Correctness
69.	follow up → follow-up	Misspelled words	Correctness
70.	root filling → root-filling	Misspelled words	Correctness
71.	All publications comparing the adverse effects of Ca(OH) ₂ /Iodoform versus ZOE as a root filling material in primary teeth pulpectomy were found	Passive voice misuse	Clarity
72.	currently prevail	Incorrect verb forms	Correctness
73.	Metapex and Vitapex are two commercial Ca(OH) ₂ /iodoform formulations that are currently prevail on the market.	Unclear sentences	Clarity
74.	were → was	Faulty subject-verb agreement	Correctness
75.	the following set of keywords were used	Passive voice misuse	Clarity
76.	publications	Wordy sentences	Clarity
77.	search → investigation	Word choice	Engagement
78.	Our initial search was conducted	Passive voice misuse	Clarity

79.	january → January	Misspelled words	Correctness
80.	<i>The titles of all studies were reviewed</i>	Passive voice misuse	Clarity
81.	and Duplicate	Conjunction use	Correctness
82.	They were using, or I was using	Incomplete sentences	Delivery
83.	<i>Using a data extraction sheet, the reviewers next independently collected data from the selected studies.</i>	Unclear sentences	Clarity
84.	study → analysis	Word choice	Engagement
85.	the sample	Determiner use (a/an/the/this, etc.)	Correctness
86.	unfavourable → unfavorable	Mixed dialects of English	Correctness
87.	The risk	Determiner use (a/an/the/this, etc.)	Correctness
88.	of → in	Wrong or missing prepositions	Correctness
89.	were → was	Faulty subject-verb agreement	Correctness
90.	cochrane → Cochrane	Misspelled words	Correctness
91.	randomised → randomized	Mixed dialects of English	Correctness
92.	In this, there → There	Wordy sentences	Clarity
93.	5 → five	Improper formatting	Correctness
94.	the risk	Determiner use (a/an/the/this, etc.)	Correctness
95.	<i>risk of bias was assessed</i>	Passive voice misuse	Clarity
96.	the 5 → The 5	Improper formatting	Correctness

97.	5 → five	Improper formatting	Correctness
98.	includes → include	Faulty subject-verb agreement	Correctness
99.	the risk, or a risk	Determiner use (a/an/the/this, etc.)	Correctness
100.	bias → discrimination	Word choice	Engagement
101.	the randomisation	Determiner use (a/an/the/this, etc.)	Correctness
102.	randomisation → randomization	Mixed dialects of English	Correctness
103.	deviation → variation	Word choice	Engagement
104.	intended → planned	Word choice	Engagement
105.	effect → impact	Word choice	Engagement
106.	The search	Determiner use (a/an/the/this, etc.)	Correctness
107.	<i>The titles of all studies were reviewed</i>	Passive voice misuse	Clarity
108.	and Duplicate	Conjunction use	Correctness
109.	criteria → requirements	Word choice	Engagement
110.	the English	Determiner use (a/an/the/this, etc.)	Correctness
111.	was without	Incorrect verb forms	Correctness
112.	follow up → follow-up	Misspelled words	Correctness
113.	, and	Punctuation in compound/complex sentences	Correctness
114.	were full	Incorrect verb forms	Correctness

115.	<i>We excluded eight studies as follows: Three studies were not in English language, one study without comparison groups, one study not fulfilled the follow up criteria and three studies full text not available.</i>	Unclear sentences	Clarity
116.	The total → A total	Determiner use (a/an/the/this, etc.)	Correctness
117.	<i>The total number of ten studies were included</i>	Passive voice misuse	Clarity
118.	),	Punctuation in compound/complex sentences	Correctness
119.	<i>pulpectomized</i>	Unknown words	Correctness
120.	and had → . They had	Hard-to-read text	Clarity
121.	period → periods	Incorrect noun number	Correctness
122.	ranged → ranging	Incorrect verb forms	Correctness
123.	From → Of	Wrong or missing prepositions	Correctness
124.	<i>ozalp</i>	Unknown words	Correctness
125.	Elbay → Albay	Misspelled words	Correctness
126.	both primary → both primary	Improper formatting	Correctness
127.	<i>(Mortazavi & Mesbahi, 2004; Bawazir et al.); (Al-Ostwani et al., 2016; Gupta & Das, 2011; Brar et al.2020; Subramaniam & Gilhotra, 2011; Elbayet al.); (Chen et al., 2017; Mortazavi & Mesbahi, 2004; Ozalp et al., 2005; Pramila et al., 2016; Bawazir et al, 2007); (Gupta & Das, 2011; ; Mortazavi & Mes...</i>	Citation style options	Correctness
128.	the aforementioned → those above,	Outdated language	Clarity

	those mentioned above, those as mentioned above, those as mentioned earlier		
129.	, 2020	Punctuation in compound/complex sentences	Correctness
130.	et al → et al.	Comma misuse within clauses	Correctness
131.	<i>Only the aforementioned Ca(OH)₂/iodoform products, Metapex and Vitapex, were used in these studies; Metapex was used in five studies (Al-Ostwani et al., 2016; Gupta & Das, 2011; Brar et al.2020; Subramaniam & Gilhotra, 2011; Elbayet al.), whereas Vitapex was used in five studies (Chen et al., 2017;...</i>	Hard-to-read text	Clarity
132.	childrens → children, children's	Misspelled words	Correctness
133.	a number, or the number	Determiner use (a/an/the/this, etc.)	Correctness
134.	, and	Comma misuse within clauses	Correctness
135.	<i>2/iodoform paste was compared</i>	Passive voice misuse	Clarity
136.	;;	Comma misuse within clauses	Correctness
137.	Elbay → Albay	Misspelled words	Correctness
138.	, 2016	Punctuation in compound/complex sentences	Correctness
139.	2016 ;	Improper formatting	Correctness
140.	),	Improper formatting	Correctness
141.	,ZOE → ; ZOE, . ZOE	Punctuation in compound/complex sentences	Correctness
142.	ecompared → compare	Incorrect verb forms	Correctness

143.	<i>The aim of this Systematic review was to compared and evaluate adverse effect of Zinc oxide eugenol and Calcium hydroxide/iodoform paste as a obturating material for primary tooth.</i>	Unclear sentences	Clarity
144.	the adverse	Determiner use (a/an/the/this, etc.)	Correctness
145.	effect → effects	Incorrect noun number	Correctness
146.	a obturating → an obturating	Determiner use (a/an/the/this, etc.)	Correctness
147.	a primary	Determiner use (a/an/the/this, etc.)	Correctness
148.	tooth → teeth	Incorrect noun number	Correctness
149.	the Hollow	Determiner use (a/an/the/this, etc.)	Correctness
150.	permanent,	Punctuation in compound/complex sentences	Correctness
151.	and apical	Conjunction use	Correctness
152.	<i>So various adverse outcomes such as Hollow tube effect, deflection of permanent, successors, cytotoxicity, bond strength of restorative material, delayed root resorption, pathological root resorption, apical microleakage of root canal filling material were included</i>	Passive voice misuse	Clarity
153.	<i>So various adverse outcomes such as Hollow tube effect, deflection of permanent, successors, cytotoxicity, bond strength of restorative material, delayed root resorption, pathological root resorption, apical microleakage of root canal filling</i>	Hard-to-read text	Clarity

material were included in this systematic review for com...

154.	,three → ; three, . Three	Punctuation in compound/complex sentences	Correctness
155.	teeth bud → tooth bud	Improper formatting	Correctness
156.	; Pramila	Improper formatting	Correctness
157.	i.e.,	Comma misuse within clauses	Correctness
158.	et al → et al.	Comma misuse within clauses	Correctness
159.	::	Comma misuse within clauses	Correctness
160.	scholar → Scholar	Confused words	Correctness
161.	english → English	Misspelled words	Correctness
162.	the english	Determiner use (a/an/the/this, etc.)	Correctness
163.	the study	Determiner use (a/an/the/this, etc.)	Correctness
164.	follow up → follow-up	Misspelled words	Correctness
165.	Full text → Full-text	Misspelled words	Correctness
166.	which	Pronoun use	Correctness
167.	which	Wordy sentences	Clarity
168.	was compared	Passive voice misuse	Clarity
169.	effect → result, product, mark	Word choice	Engagement
170.	Hollow tube effect which was compared in five studies effect (Al-Ostwani et al., 2016; Subramaniam & Gilhotra, 2011; Mortazavi & Mesbahi,	Incomplete sentences	Delivery

2004; Brar et al., 2020; Chen et al., 2017).

171.	study → studies	Incorrect noun number	Correctness
172.	, both	Punctuation in compound/complex sentences	Correctness
173.	metapex → meta per	Misspelled words	Correctness
174.	vitapex	Unknown words	Correctness
175.	the other	Determiner use (a/an/the/this, etc.)	Correctness
176.	hollow → open	Word choice	Engagement
177.	<i>Out of these five studies, in two study (Subramaniam & Gilhotra, 2011; Mortazavi & Mesbahi, 2004) both ZOE and metapex/vitapex not showed hollow tube effect whereas, in other three studies (Al-Ostwani et al., 2016; Brar et al., 2020; Chen et al., 2017) hollow tube effect only showed by Metapex/Vita...</i>	Hard-to-read text	Clarity
178.	Vitapex .	Improper formatting	Correctness
179.	<i>the pathological resorption of roots were compared</i>	Passive voice misuse	Clarity
180.	,study → ; study, . Study	Punctuation in compound/complex sentences	Correctness
181.	month → months	Incorrect noun number	Correctness
182.	metapex → meta per	Misspelled words	Correctness
183.	vitapex	Unknown words	Correctness
184.	showed → show	Incorrect verb forms	Correctness

185.	A study, or The study	Determiner use (a/an/the/this, etc.)	Correctness
186.	<i>Study by Subramaniam & Gilhotra, 2011 showed that at 3 months, only ZOE show pathological resorption of root and at 6,12 and 18 months no pathological resorption seen for both ZOE and metapex/vitapex.</i>	Unclear sentences	Clarity
187.	3 → three	Improper formatting	Correctness
188.	show → showed	Incorrect verb forms	Correctness
189.	root → roots	Incorrect noun number	Correctness
190.	, and	Comma misuse within clauses	Correctness
191.	, and	Comma misuse within clauses	Correctness
192.	, no	Punctuation in compound/complex sentences	Correctness
193.	was seen	Incorrect verb forms	Correctness
194.	metapex → meta per	Misspelled words	Correctness
195.	vitapex	Unknown words	Correctness
196.	2016 ;	Improper formatting	Correctness
197.	the External	Determiner use (a/an/the/this, etc.)	Correctness
198.	vitapex,	Punctuation in compound/complex sentences	Correctness
199.	vitapex	Unknown words	Correctness
200.	ZOE,	Punctuation in compound/complex sentences	Correctness
201.	material → materials	Incorrect noun number	Correctness

202.	follow up → follow-up	Misspelled words	Correctness
203.	; Pramila	Improper formatting	Correctness
204.	compared,	Punctuation in compound/complex sentences	Correctness
205.	bud → buds	Incorrect noun number	Correctness
206.	the eruption, or an eruption	Determiner use (a/an/the/this, etc.)	Correctness
207.	an adverse	Determiner use (a/an/the/this, etc.)	Correctness
208.	conducted	Wordy sentences	Clarity
209.	3 → three	Improper formatting	Correctness
210.	follow up → follow-up	Misspelled words	Correctness
211.	vitapex	Unknown words	Correctness
212.	, but	Punctuation in compound/complex sentences	Correctness
213.	up,	Comma misuse within clauses	Correctness
214.	the at	Determiner use (a/an/the/this, etc.)	Correctness
215.	follow up → follow-up	Misspelled words	Correctness
216.	the Deflection	Determiner use (a/an/the/this, etc.)	Correctness
217.	, whereas	Punctuation in compound/complex sentences	Correctness
218.	whereas in → . In contrast, in	Hard-to-read text	Clarity
219.	, in	Comma misuse within clauses	Correctness

220.	a study, or the study	Determiner use (a/an/the/this, etc.)	Correctness
221.	material → materials	Incorrect noun number	Correctness
222.	, which	Punctuation in compound/complex sentences	Correctness
223.	results → resulted	Faulty tense sequence	Correctness
224.	, compared	Punctuation in compound/complex sentences	Correctness
225.	metapex → meta per	Misspelled words	Correctness
226.	<i>In the study conducted by Gupta & Das in 2011, cytotoxicity of obturating material which ultimately results in necrosis of bone and cementum compared amongst the ZOE and metapex and showed that the ZOE was more cytotoxic than Metapex.</i>	Unclear sentences	Clarity
227.	which	Pronoun use	Correctness
228.	was evaluated	Wordy sentences	Clarity
229.	was evaluate → was evaluated	Incorrect verb forms	Correctness
230.	and → which	Conjunction use	Correctness
231.	, and	Punctuation in compound/complex sentences	Correctness
232.	vitapex	Unknown words	Correctness
233.	was evaluated	Incorrect verb forms	Correctness
234.	restorative → vital	Word choice	Clarity
235.	a restorative	Determiner use (a/an/the/this, etc.)	Correctness

236.	restorative → healthy, medicinal, beneficial, vital	Word choice	Engagement
237.	the restorative	Determiner use (a/an/the/this, etc.)	Correctness
238.	system → procedure	Word choice	Engagement
239.	point → points	Faulty subject-verb agreement	Correctness
240.	amongst → among	Wrong or missing prepositions	Correctness
241.	restorative → beneficial, healthy, vital, medicinal	Word choice	Engagement
242.	the restorative	Determiner use (a/an/the/this, etc.)	Correctness
243.	system → procedure	Word choice	Engagement
244.	more than	Misuse of quantifiers	Correctness
245.	than metapex → than metapex	Improper formatting	Correctness
246.	metapex → meta per	Misspelled words	Correctness
247.	childrens → children	Misspelled words	Correctness
248.	5 → five	Improper formatting	Correctness
249.	primary → direct	Word choice	Engagement
250.	3 → three	Improper formatting	Correctness
251.	the material	Determiner use (a/an/the/this, etc.)	Correctness
252.	a deflection	Determiner use (a/an/the/this, etc.)	Correctness
253.	the material	Determiner use (a/an/the/this, etc.)	Correctness

254.	material → materials	Incorrect noun number	Correctness
255.	a Hollow	Determiner use (a/an/the/this, etc.)	Correctness
256.	sealapex	Unknown words	Correctness
257.	6 → six	Improper formatting	Correctness
258.	follow-up → follow-up	Misspelled words	Correctness
259.	sealapex	Unknown words	Correctness
260.	month → months	Incorrect noun number	Correctness
261.	resorption.	Closing punctuation	Correctness
262.	saud → Saud, said	Misspelled words	Correctness
263.	, Saudi	Improper formatting	Correctness
264.	arabia → Arabia	Misspelled words	Correctness
265.	, RCT	Improper formatting	Correctness
266.	The number	Determiner use (a/an/the/this, etc.)	Correctness
267.	Primary mandibular	Misplaced words or phrases	Correctness
268.	3,6 ,	Improper formatting	Correctness
269.	3 → three	Improper formatting	Correctness
270.	show → shows	Faulty subject-verb agreement	Correctness
271.	the root, or a root	Determiner use (a/an/the/this, etc.)	Correctness
272.	, and	Punctuation in compound/complex sentences	Correctness

273.	months,	Punctuation in compound/complex sentences	Correctness
274.	was seen	Incorrect verb forms	Correctness
275.	material → materials	Incorrect noun number	Correctness
276.	material → materials	Incorrect noun number	Correctness
277.	is more	Incorrect verb forms	Correctness
278.	Metapex .	Improper formatting	Correctness
279.	endoflas → end of las	Misspelled words	Correctness
280.	The hollow	Determiner use (a/an/the/this, etc.)	Correctness
281.	metapex → meta per	Misspelled words	Correctness
282.	,other → ; other, , and other, . Other	Punctuation in compound/complex sentences	Correctness
283.	3 → three	Improper formatting	Correctness
284.	not showed → did not show	Incorrect verb forms	Correctness
285.	the path	Determiner use (a/an/the/this, etc.)	Correctness
286.	succadaneous → succedaneous, subcutaneous	Misspelled words	Correctness
287.	succadaneous → succedaneous, subcutaneous	Misspelled words	Correctness
288.	material → materials	Incorrect noun number	Correctness
289.	follow up → follow-up	Misspelled words	Correctness
290.	vitapex	Unknown words	Correctness

291.	vitapex,	Punctuation in compound/complex sentences	Correctness
292.	fill,	Punctuation in compound/complex sentences	Correctness
293.	by	Wrong or missing prepositions	Correctness
294.	ZOE.	Closing punctuation	Correctness
295.	Elbay → Albay, Albany, Elbaz	Misspelled words	Correctness
296.	university → University	Confused words	Correctness
297.	, turkey	Improper formatting	Correctness
298.	a restorative	Determiner use (a/an/the/this, etc.)	Correctness
299.	group.	Closing punctuation	Correctness
300.	double blinded → double-blinded	Misspelled words	Correctness
301.	months ,	Improper formatting	Correctness
302.	, only	Improper formatting	Correctness
303.	the Deflection	Determiner use (a/an/the/this, etc.)	Correctness
304.	months,	Punctuation in compound/complex sentences	Correctness
305.	, whereas	Punctuation in compound/complex sentences	Correctness
306.	ether2 → other 2	Misspelled words	Correctness
307.	material → materials	Incorrect noun number	Correctness
308.	didn't show → didn't show	Improper formatting	Correctness

309.	show → deliver	Word choice	Engagement
310.	, India	Improper formatting	Correctness
311.	single blinded → single-blinded	Misspelled words	Correctness
312.	metapex → meta per	Misspelled words	Correctness
313.	follow up → follow-up	Misspelled words	Correctness
314.	compares → compared	Incorrect verb forms	Correctness
315.	Metapex.	Closing punctuation	Correctness
316.	control ,	Improper formatting	Correctness
317.	;;	Comma misuse within clauses	Correctness
318.	, but	Punctuation in compound/complex sentences	Correctness
319.	vitapex	Unknown words	Correctness
320.	showed → show	Incorrect verb forms	Correctness
321.	),	Punctuation in compound/complex sentences	Correctness
322.	as well as → and	Wordy sentences	Clarity
323.	,it → ; it, . It	Punctuation in compound/complex sentences	Correctness
324.	it was found	Passive voice misuse	Clarity
325.	delayed → slowed	Word choice	Engagement
326.	; Mortazavi	Punctuation in compound/complex sentences	Correctness
327.	Elbay → Albay	Misspelled words	Correctness

328.	et al. → et al.	Comma misuse within clauses	Correctness
329.	was → were	Faulty subject-verb agreement	Correctness
330.	<i>only two studies were determined</i>	Passive voice misuse	Clarity
331.	a low	Determiner use (a/an/the/this, etc.)	Correctness
332.	et al. → et al.	Comma misuse within clauses	Correctness
333.	Elbay → Albay	Misspelled words	Correctness
334.	<i>only two studies were determined to have low risk of bias {figure 2} (Brar et al.,2020; Pramila et al., 2016; high quality), five studies were shown to have a moderate risk of bias (Al-Ostwani et al., 2016; Chen et al., 2017; Mortazavi & Mesbahi, 2004; Ozalp et al., 2005; Subramaniam & Gilhotra, 20...</i>	Hard-to-read text	Clarity
335.	study design	Wordy sentences	Clarity
336.	a lack	Determiner use (a/an/the/this, etc.)	Correctness
337.	a variety of → various	Wordy sentences	Clarity
338.	unclear → fuzzy, vague, dark, opaque	Word choice	Engagement
339.	failing → failure	Confused words	Correctness
340.	High quality → High-quality	Misspelled words	Correctness
341.	means → mean	Faulty subject-verb agreement	Correctness
342.	low risk → low-risk	Misspelled words	Correctness
343.	The use	Determiner use (a/an/the/this, etc.)	Correctness

344.	has been → was	Faulty tense sequence	Correctness
345.	the early	Determiner use (a/an/the/this, etc.)	Correctness
346.	century to → century to	Improper formatting	Correctness
347.	a root	Determiner use (a/an/the/this, etc.)	Correctness
348.	the of → the of	Improper formatting	Correctness
349.	the of	Wordy sentences	Clarity
350.	of	Wrong or missing prepositions	Correctness
351.	a variety of → various	Wordy sentences	Clarity
352.	certain → specific	Word choice	Engagement
353.	certain → certainly	Misuse of modifiers	Correctness
354.	, thats	Punctuation in compound/complex sentences	Correctness
355.	thats → that's, that	Misspelled words	Correctness
356.	a need	Determiner use (a/an/the/this, etc.)	Correctness
357.	introduced → introduce	Incorrect verb forms	Correctness
358.	the material → a material	Determiner use (a/an/the/this, etc.)	Correctness
359.	a less, or the less	Determiner use (a/an/the/this, etc.)	Correctness
360.	less → fewer	Misuse of quantifiers	Correctness
361.	adverse → negative	Word choice	Engagement

362.	effect → impact	Word choice	Engagement
363.	effect → effects	Incorrect noun number	Correctness
364.	metapex → meta per	Misspelled words	Correctness
365.	vitapex	Unknown words	Correctness
366.	, which	Punctuation in compound/complex sentences	Correctness
367.	their → its	Pronoun use	Correctness
368.	has less	Incorrect verb forms	Correctness
369.	<i>One such material is calcium hydroxide/iodoform paste or metapex or vitapex which is better than ZOE in their properties and less adverse effects.</i>	Unclear sentences	Clarity
370.	are → is	Faulty subject-verb agreement	Correctness
371.	review → reviews	Incorrect noun number	Correctness
372.	which evaluate → that evaluate	Pronoun use	Correctness
373.	<i>There are various systematic review which evaluate and compared the clinical and radiographic success of this two material.</i>	Unclear sentences	Clarity
374.	compared → compare	Faulty tense sequence	Correctness
375.	this two → these two	Determiner use (a/an/the/this, etc.)	Correctness
376.	material → materials	Incorrect noun number	Correctness
377.	a systematic, or the systematic	Determiner use (a/an/the/this, etc.)	Correctness
378.	the randomisation	Determiner use (a/an/the/this, etc.)	Correctness

		etc.)	
379.	randomisation → randomization	Mixed dialects of English	Correctness
380.	the intended	Determiner use (a/an/the/this, etc.)	Correctness
381.	the intended	Determiner use (a/an/the/this, etc.)	Correctness
382.	intended → deliberate, intentional, purposeful, calculated	Word choice	Engagement
383.	effect → impact	Word choice	Engagement
384.	the measurement	Determiner use (a/an/the/this, etc.)	Correctness
385.	the selection, or a selection	Determiner use (a/an/the/this, etc.)	Correctness
386.	mesabahi	Unknown words	Correctness
387.	Elbay → Albay, Albany	Misspelled words	Correctness
388.	The red, or A red	Determiner use (a/an/the/this, etc.)	Correctness
389.	High-risk → High-risk	Misspelled words	Correctness
390.	A green, or The green	Determiner use (a/an/the/this, etc.)	Correctness
391.	Low-risk → Low-risk	Misspelled words	Correctness
392.	a question	Determiner use (a/an/the/this, etc.)	Correctness
393.	this two → these two	Determiner use (a/an/the/this, etc.)	Correctness
394.	were compared	Incorrect verb forms	Correctness

395.	, such	Punctuation in compound/complex sentences	Correctness
396.	the Hollow	Determiner use (a/an/the/this, etc.)	Correctness
397.	permanent,	Punctuation in compound/complex sentences	Correctness
398.	<i>In this systematic review, various adverse outcomes of this two materials compared such as Hollow tube effect, deflection of permanent, successors, cytotoxicity, bond/adherence strength of restorative material, delayed root resorption, pathological root resorption and apical microleakage of root ca...</i>	Hard-to-read text	Clarity
399.	ever	Wordy sentences	Clarity
400.	, all	Punctuation in compound/complex sentences	Correctness
401.	are → were	Faulty tense sequence	Correctness
402.	randomised → randomized	Mixed dialects of English	Correctness
403.	trial → trials	Incorrect noun number	Correctness
404.	with the	Wrong or missing prepositions	Correctness
405.	Amongst → Among	Wrong or missing prepositions	Correctness
406.	Amongst all studies, five → Five	Wordy sentences	Clarity
407.	a study, or the study	Determiner use (a/an/the/this, etc.)	Correctness
408.	Gilhotra → Gilhotra's	Incorrect noun number	Correctness

409.	study → survey	Word choice	Engagement
410.	material → materials	Incorrect noun number	Correctness
411.	i.e.,	Comma misuse within clauses	Correctness
412.	not,	Punctuation in compound/complex sentences	Correctness
413.	showed → show	Faulty tense sequence	Correctness
414.	study → survey	Word choice	Engagement
415.	study → studies	Incorrect noun number	Correctness
416.	metapex → meta per	Misspelled words	Correctness
417.	vitapex	Unknown words	Correctness
418.	a hollow	Determiner use (a/an/the/this, etc.)	Correctness
419.	, but	Punctuation in compound/complex sentences	Correctness
420.	showed → show	Incorrect verb forms	Correctness
421.	showed	Wordy sentences	Clarity
422.	key → critical	Word choice	Engagement
423.	a propensity → the propensity	Determiner use (a/an/the/this, etc.)	Correctness
424.	metapex → meta per	Misspelled words	Correctness
425.	vitapex	Unknown words	Correctness
426.	optimal → optical	Confused words	Correctness
427.	periradicular	Unknown words	Correctness

428.	<i>periradicular</i>	Unknown words	Correctness
429.	<i>the healing</i>	Determiner use (a/an/the/this, etc.)	Correctness
430.	<i>process,</i>	Comma misuse within clauses	Correctness
431.	<i>the root</i>	Determiner use (a/an/the/this, etc.)	Correctness
432.	results → <i>resulting</i>	Incorrect verb forms	Correctness
433.	<i>, results</i>	Punctuation in compound/complex sentences	Correctness
434.	<i>, which</i>	Punctuation in compound/complex sentences	Correctness
435.	<i>the overall</i>	Determiner use (a/an/the/this, etc.)	Correctness
436.	<i>the succedaneous</i>	Determiner use (a/an/the/this, etc.)	Correctness
437.	<i>Due to this delay in healing process the resorption of root is also get affected results in delayed root resorption which affects overall surrounding tissue and succedaneous tooth bud(29).</i>	Unclear sentences	Clarity
438.	<i>an adverse</i>	Determiner use (a/an/the/this, etc.)	Correctness
439.	outcome → <i>outcomes</i>	Incorrect noun number	Correctness
440.	<i>it delayed, she delayed, he delayed, they delayed</i>	Incomplete sentences	Correctness
441.	<i>tw</i>	Unknown words	Correctness
442.	showed → <i>shown</i>	Incorrect verb forms	Correctness
443.			

	<i>It was found</i>	Passive voice misuse	Clarity
444.	property → properties	Incorrect noun number	Correctness
445.	the tooth, or a tooth	Determiner use (a/an/the/this, etc.)	Correctness
446.	tooth,	Punctuation in compound/complex sentences	Correctness
447.	deflecting → deflect, be deflecting	Modal verbs	Correctness
448.	succadaneous → succedaneous, subcutaneous	Misspelled words	Correctness
449.	),	Punctuation in compound/complex sentences	Correctness
450.	<i>Amongst the ideal properties of root canal filling material, one of the property is when the material is pressed beyond the apex of tooth it should not set to a hard mass which could deflecting an erupting succadaneous tooth(31),(32).</i>	Unclear sentences	Clarity
451.	the case	Determiner use (a/an/the/this, etc.)	Correctness
452.	<i>In case of ZOE, Many reports have stated that slow resorption of this cement in canals, when forced or pressed beyond the apex, forms a hard mass, and as a result, there is a risk of deflection of erupting succedaneous teeth due to its hardness (33).</i>	Intricate text	Clarity
453.	hard → rigid	Word choice	Engagement
454.	<i>The essence of ZOE production, according to one theory, is the reaction of eugenol with bivalent zinc ions to create insoluble chelation,</i>	Unclear sentences	Clarity

*which wraps remanent zinc oxide in it
and forms a solid mass.*

455.	succadaneuos → succedaneous	Misspelled words	Correctness
456.	, and	Punctuation in compound/complex sentences	Correctness
457.	quickly	Misplaced words or phrases	Correctness
458.	. (	Improper formatting	Correctness
459.	succadaneous → succedaneous, subcutaneous	Misspelled words	Correctness
460.	a adverse → an adverse	Determiner use (a/an/the/this, etc.)	Correctness
461.	study → survey	Word choice	Engagement
462.	vitapex	Unknown words	Correctness
463.	3 → three	Improper formatting	Correctness
464.	follow up → follow-up	Misspelled words	Correctness
465.	, however → ; however, . However	Punctuation in compound/complex sentences	Correctness
466.	however,	Punctuation in compound/complex sentences	Correctness
467.	follow up → follow-up	Misspelled words	Correctness
468.	, however → ; however, . However	Punctuation in compound/complex sentences	Correctness
469.	however,	Punctuation in compound/complex sentences	Correctness
470.	discovered → found	Word choice	Engagement
471.	the eruption	Determiner use (a/an/the/this,	Correctness

		etc.)	
472.	The root canal filling materials must have	Wordy sentences	Clarity
473.	since → Since	Improper formatting	Correctness
474.	as well as → and	Wordy sentences	Clarity
475.	gutta-percha → gutta-percha	Misspelled words	Correctness
476.	is → are	Faulty subject-verb agreement	Correctness
477.	chances → chance	Incorrect noun number	Correctness
478.	the primary	Determiner use (a/an/the/this, etc.)	Correctness
479.	the permanent	Determiner use (a/an/the/this, etc.)	Correctness
480.	<i>Therefore, there is more chances of apical microleakage in primary tooth compared to permanent tooth.</i>	Unclear sentences	Clarity
481.	a single	Determiner use (a/an/the/this, etc.)	Correctness
482.	the ZOE	Determiner use (a/an/the/this, etc.)	Correctness
483.	group,	Punctuation in compound/complex sentences	Correctness
484.	the vitapex	Determiner use (a/an/the/this, etc.)	Correctness
485.	vitapex	Unknown words	Correctness
486.	<i>Only single study by Bawazir et al.2007 included in this systematic review compared apical microleakage of root canal filling</i>	Hard-to-read text	Clarity

material in primary tooth and reported that for ZOE group there was a high apical microleakage than vitapex group due to shrinkage of this material after setting.

487.	have an impact on → impact	Wordy sentences	Clarity
488.	restorative → vital, therapeutic	Word choice	Clarity
489.	restorative → beneficial, healthy, vital, medicinal	Word choice	Engagement
490.	system → procedure	Word choice	Engagement
491.	microtensile → micro tensile	Misspelled words	Correctness
492.	uTBS → UBS, DBS	Misspelled words	Correctness
493.		Tone suggestions	Delivery
494.	restorative → vital	Word choice	Clarity
495.	restorative → vital, therapeutic	Word choice	Clarity
496.	restorative → vital, healthy, therapeutic, beneficial	Word choice	Engagement
497.	systems → procedures, techniques	Word choice	Engagement
498.	restorative → therapeutic	Word choice	Clarity
499.	restorative → beneficial, healthy, vital, medicinal	Word choice	Engagement
500.	metapex → meta per	Misspelled words	Correctness
501.	eavex → caves, cave	Misspelled words	Correctness
502.	restorative → vital, therapeutic	Word choice	Clarity
503.	restorative →	Word choice	Engagement

	beneficial, healthy, vital, medicinal		
504.	<i>Additionally, both Metapex and Cavex ZOE affected the uTBS of restorative systems similarly (P>0.05).</i>	Unclear sentences	Clarity
505.	restorative → beneficial, healthy, vital, medicinal	Word choice	Engagement
506.	systems → approaches, procedures, techniques	Word choice	Engagement
507.	<i>It was reported</i>	Passive voice misuse	Clarity
508.	may → might	Faulty tense sequence	Correctness
509.	two	Wordy sentences	Clarity
510.	metapex → meta per	Misspelled words	Correctness
511.	as a result of → due to	Wordy sentences	Clarity
512.	, including	Punctuation in compound/complex sentences	Correctness
513.	pulpally → pulpal, palpably, pulpily	Misspelled words	Correctness
514.	characterised → characterized	Mixed dialects of English	Correctness
515.	as a result of → due to	Wordy sentences	Clarity
516.	external → outer, exterior	Word choice	Engagement
517.	and proceeds → . It proceeds	Hard-to-read text	Clarity
518.	beginning → starting	Word choice	Engagement
519.	the root	Determiner use (a/an/the/this, etc.)	Correctness
520.	, while	Punctuation in compound/complex sentences	Correctness

521.	noticed → seen, detected, caught	Word choice	Engagement
522.	, and	Punctuation in compound/complex sentences	Correctness
523.	in a similar manner → similarly	Wordy sentences	Clarity
524.	which compared → that compared	Pronoun use	Correctness
525.	the pathological	Misspelled words	Correctness
526.	The result	Determiner use (a/an/the/this, etc.)	Correctness
527.	<i>Result of the study conducted by ozalp et al. in 2005 corresponding to study by Subramaniam & Gilhotra, 2011 reported that At 6,12 and 18 month follow up, both ZOE and metapex/vitapex did not showed pathological root/bone resorption.</i>	Unclear sentences	Clarity
528.	study → survey	Word choice	Engagement
529.	ozalp	Unknown words	Correctness
530.	2005,	Punctuation in compound/complex sentences	Correctness
531.	a study	Determiner use (a/an/the/this, etc.)	Correctness
532.	month → months	Incorrect noun number	Correctness
533.	follow up → follow-up	Misspelled words	Correctness
534.	metapex → meta per	Misspelled words	Correctness
535.	vitapex	Unknown words	Correctness
536.	showed → show	Incorrect verb forms	Correctness

537.	Gilhotra,	Punctuation in compound/complex sentences	Correctness
538.	, At	Punctuation in compound/complex sentences	Correctness
539.	3 → three	Improper formatting	Correctness
540.	root resorption	Wordy sentences	Clarity
541.	the root	Determiner use (a/an/the/this, etc.)	Correctness
542.	In another	Wrong or missing prepositions	Correctness
543.	in nature	Wordy sentences	Clarity
544.	is → was	Faulty tense sequence	Correctness
545.	vitapex,	Punctuation in compound/complex sentences	Correctness
546.	vitapex	Unknown words	Correctness
547.	ZOE,	Punctuation in compound/complex sentences	Correctness
548.	follow up → follow-up	Misspelled words	Correctness
549.	<i>Another study by Pramila et al., 2016 in which the external and internal root resorption which was pathological in nature and showed that the External root resorption is highest in vitapex followed by ZOE whereas, None of the material showed internal root resorption at any follow up visits.</i>		Clarity
550.	important → crucial, essential, critical	Word choice	Engagement
551.	feature → features	Incorrect noun number	Correctness

552.	<i>periradicular</i>	Unknown words	Correctness
553.	the setting	Determiner use (a/an/the/this, etc.)	Correctness
554.	<i>periradicular</i>	Unknown words	Correctness
555.	<i>sealer penetration into periradicular tissues should be averted</i>	Passive voice misuse	Clarity
556.	is inadvertently	Incorrect verb forms	Correctness
557.	apex,	Punctuation in compound/complex sentences	Correctness
558.	a chance, or the chance	Determiner use (a/an/the/this, etc.)	Correctness
559.	, causing	Punctuation in compound/complex sentences	Correctness
560.	conducted	Wordy sentences	Clarity
561.	the cytotoxicity	Determiner use (a/an/the/this, etc.)	Correctness
562.	material → materials	Incorrect noun number	Correctness
563.	hypothesised → hypothesized	Mixed dialects of English	Correctness
564.	, including → ; including, , and including, . Including	Punctuation in compound/complex sentences	Correctness
565.	<i>periradicular</i>	Unknown words	Correctness
566.	, Eugenol → ; Eugenol, . Eugenol	Punctuation in compound/complex sentences	Correctness
567.	were → was	Faulty subject-verb agreement	Correctness
568.	. This contribute, ; this contribute	Punctuation in compound/complex sentences	Correctness

569.	LIMITATION → LIMITATIONS	Incorrect noun number	Correctness
570.	a longer	Determiner use (a/an/the/this, etc.)	Correctness
571.	follow up → follow-up	Misspelled words	Correctness
572.	follow up → follow-up	Misspelled words	Correctness
573.	a maximum	Determiner use (a/an/the/this, etc.)	Correctness
574.	et al → et al.	Comma misuse within clauses	Correctness
575.	Elbay → Albay	Misspelled words	Correctness
576.	a single	Determiner use (a/an/the/this, etc.)	Correctness
577.	studies,	Punctuation in compound/complex sentences	Correctness
578.	than	Wrong or missing prepositions	Correctness
579.	<i>two or more than two adverse effects were compared</i>	Passive voice misuse	Clarity
580.	a primary	Determiner use (a/an/the/this, etc.)	Correctness
581.	teeth → teeth	Incorrect noun number	Correctness
582.	On the basis of → Based on	Wordy sentences	Clarity
583.	, and	Punctuation in compound/complex sentences	Correctness
584.	this adverse → these adverse	Determiner use (a/an/the/this, etc.)	Correctness
585.	adverse → negative	Word choice	Engagement

586.	<i>On the basis of the current study findings, we believe that Zinc oxide eugenol showed more adverse effects than Calcium hydroxide/iodoform and most of this adverse effects of ZOE are Due to its delayed resorption.</i>	Unclear sentences	Clarity
587.	These is → This is	Pronoun use	Correctness
588.	is → are	Faulty subject-verb agreement	Correctness
589.	, that's	Punctuation in compound/complex sentences	Correctness
590.	update → updates	Faulty subject-verb agreement	Correctness
591.	update:	Misuse of semicolons, quotation marks, etc.	Correctness
592.	literature review	Wordy sentences	Clarity
593.	metapex → meta per	Misspelled words	Correctness
594.	the cell	Determiner use (a/an/the/this, etc.)	Correctness
595.	arrest → arresting	Incorrect verb forms	Correctness
596.	the cell	Determiner use (a/an/the/this, etc.)	Correctness
597.	12. Khan A, Ahmad A, Akhtar F, Yousuf S, Xess I, Khan LA, et al. Induction of oxidative stress as a possible mechanism of the antifungal action of three phenylpropanoids: Antifungal activity of phenylpropanoids.	Hard-to-read text	Clarity
598.	formocresol	Unknown words	Correctness
599.	pastes:	Misuse of semicolons, quotation marks, etc.	Correctness

600.	<i>Clinical and radiological evaluation of zinc oxide-eugenol and Maisto's paste as obturating materials in infected primary teeth--nine months study.</i>	Hard-to-read text	Clarity
601.	<i>endodontically</i>	Unknown words	Correctness
602.	in relation to → about, to, with, concerning	Wordy sentences	Clarity
603.	vs.	Comma misuse within clauses	Correctness
604.	, and	Comma misuse within clauses	Correctness
605.	<i>in the formulation of the root canal filling paste plays</i>	COMPARATIVE EVALUATION OF ANTIMICROBIAL EFFICACY OF THREE CALCIUM ... https://nebula.wsimg.com/ea814572e16c81afc15e4e2e84b264ad?AccessKeyId=44189AF8BC7E3D5EEFEF&disposition=0&alloworigi n=1	Originality
606.	<i>the aim of this systematic review was to assess</i>	C55 CARDIOPULMONARY EFFECTS OF AIR POLLUTION: Panel Studies On Acute Effects Of Air Pollution In Patients With COPD: A Systematic Review And Meta-Analysis	Originality
607.	<i>and Zinc oxide eugenol as root canal filling materials in primary teeth.</i>	Pulpectomy and Root Canal Treatment (RCT) in Primary ... - SpringerLink https://link.springer.com/chapter/10.1007/978-3-319-27553-6_6	Originality
608.	<i>The Preferred Reporting Items for Systematic Reviews and Meta-Analysis statement [PRISMA</i>	Protocol: A systematic review and meta-analysis of the role of fetal and infantile environmental exposure in etiopathogenesis of infantile hypertrophic pyloric stenosis	Originality
609.	<i>studies that did not match the</i>	General versus sports-specific	Originality

	<i>inclusion criteria,</i>	injury prevention programs in athletes: A systematic review on the effects on performance	
610.	<i>ten studies were included in this Systematic review.</i>	SYSTEMATIC REVIEW Gingival Recession after Surgical Endodontic ... https://www.quintessence-publishing.com/deu/de/article-download/1176847/oral-health-and-preventive-dentistry/2021/volume-19/gingival-recession-after-surgical-endodontic-treatment-and-quality-of-life-a-systematic-review-and-meta-analysis	Originality
611.	<i>et al., 2016). The aim of this Systematic review was to</i>	Effectiveness of Group Self-Management Interventions for Persons with Chronic Conditions: A Systematic Review	Originality
612.	<i>the effect of root canal filling material on the bond strength of</i>	Push-out bond strength of different intracanal posts in the anterior ... https://www.drjournal.net/article.asp?issn=1735-3327;year=2017;volume=14;issue=5;spage=336;epage=343;aulast=Pasdar	Originality
613.	<i>Studies included in the qualitative synthesis [n=10</i>	A qualitative synthesis of the positive and negative impacts related to ... https://bmchealthservres.biomedcentral.com/articles/10.1186/s12913-016-1753-3	Originality
614.	<i>the effect of root canal filling material on the Bond strength</i>	Push-out bond strength of different intracanal posts in the anterior ... https://www.drjournal.net/article.asp?issn=1735-3327;year=2017;volume=14;issue=5;spage=336;epage=343;aulast=Pasdar	Originality

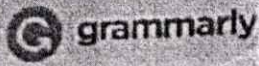
615.	<i>to the physical, chemical, and biological characteristics of</i>	Physical Chemical and Biological Characteristics of Drinking Water ... https://graduateway.com/the-microbiological-analysis-of-water-samples-from-davao-city-water-district-and-dumoy-deepwell/	Originality
616.	<i>between the obturation material and the root canal walls.</i>	Comparison sealability of root canal obturation using bioceramic sealer ... https://iopscience.iop.org/article/10.1088/1742-6596/884/1/012111	Originality
617.	<i>Root canal sealers have an impact on the</i>	Physical Properties of 5 Root Canal Sealers - LBMD https://lbmd.coe.pku.edu.cn/PDF/JOE%202013%20Physical%20Properties%20of%205%20Root%20Canal%20Sealers.pdf	Originality
618.	<i>There were no significant differences between the three</i>	Within-Sulfonylurea-Class Evaluation of Time to Intensification with Insulin (ZODIAC-43)	Originality
619.	<i>in the present study may be attributed to</i>	Psychological Predictors of Facebook Use	Originality
620.	<i>External resorption begins from the external or cervical surface of the tooth and proceeds inwards and Internal resorption (IR) is a rare, insidious, resorptive pathological process, beginning in the pulpal space and extending into the surrounding dentin. Internal resorption is noticed in the inner...</i>	An Insight into Internal Resorption - Hindawi https://www.hindawi.com/journals/isrn/2014/759326/	Originality
621.	<i>On the basis of the current study findings, we</i>	Evaluating the content validity of two versions of an instrument used in measuring pediatric pain knowledge and attitudes in the Ghanaian context	Originality

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623.	<i>Kubota K, Golden BE, Penugonda B. Root canal filling materials for primary teeth: a review of the literature. ASDC J Dent Child. 1992</i>	Pulpectomy and Root Canal Treatment (RCT) in Primary ... - SpringerLink https://link.springer.com/chapter/10.1007/978-3-319-27553-6_6	Originality
624.	<i>Gupta S, Das G. Clinical and radiographic evaluation of zinc oxide eugenol and metapex in root canal treatment of primary teeth. J Indian Soc Pedod Prev Dent. 2011;29</i>	Clinical and radiographic evaluation of ... - Head & Face Medicine https://head-face-med.biomedcentral.com/articles/10.1186/s13005-017-0145-1	Originality
625.	<i>Eugenol alters the integrity of cell membrane and acts against the nosocomial pathogen Proteus mirabilis. Arch Pharm Res.</i>	Eugenol alters the integrity of cell membrane and acts against the ... https://link.springer.com/article/10.1007/s12272-013-0028-3	Originality
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627.	<i>Darvishi E, Omidi M, Bushehri AAS, Golshani A, Smith ML. The Antifungal Eugenol Perturbs Dual Aromatic and Branched-Chain Amino Acid Permeases in the Cytoplasmic Membrane of Yeast.</i>	Zinc oxide and silver nanoparticles toxicity in the baker's yeast, Saccharomyces cerevisiae	Originality
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629.	<i>Lopes HP. Mechanisms of antimicrobial activity of calcium hydroxide: a critical review. Int Endod J. 1999 Sep;32(5):361-9.</i>	Factors associated with the technical quality of root canal fillings ...	Originality

		http://revodonto.bvsalud.org/scielo.php?script=sci_arttext&pid=S1677-32252016000100008	
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631.	<i>Clinical and radiological evaluation of zinc oxide-eugenol and Maisto's paste as obturating materials in infected primary teeth--nine months study. J Indian Soc Pedod Prev Dent. 1996</i>	Pulpectomy and Root Canal Treatment (RCT) in Primary ... - SpringerLink https://link.springer.com/chapter/10.1007/978-3-319-27553-6_6	Originality
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634.	<i>Primosch RE, Glomb TA, Jerrell RG. Primary tooth pulp therapy as taught in predoctoral pediatric dental programs in the United States. Pediatr Dent. 1997</i>	Pulpectomy and Root Canal Treatment (RCT) in Primary ... - SpringerLink https://link.springer.com/chapter/10.1007/978-3-319-27553-6_6	Originality
635.	<i>Mortazavi M, Mesbahi M. Comparison of zinc oxide and eugenol, and Vitapex for root canal treatment of necrotic primary teeth. Int J Paediatr Dent. 2004</i>	Pulpectomy and Root Canal Treatment (RCT) in Primary ... - SpringerLink https://link.springer.com/chapter/10.1007/978-3-319-27553-6_6	Originality

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637.	<i>Chawla HS, Mani SA, Tewari A, Goyal A. Calcium hydroxide as a root canal filling material in primary</i>	Evaluation of a mixture of zinc oxide, calcium hydroxide, and sodium ... https://www.jisppd.com/article.asp?issn=0970-4388;year=2008;volume=26;issue=2;spage=53;epage=58;aulast=Cawla	Originality
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639.	<i>Sweet CA. Procedure for Treatment of Exposed and Pulpless Deciduous Teeth</i>	Scientific Article Predicting pulpectomy success and its ... - AAPD https://www.aapd.org/globalasset/s/media/publications/archives/col-18-01.pdf	Originality
640.	<i>The Journal of the American Dental Association (1922)</i>	The Journal of the American Dental Association (1922) https://www.sciencedirect.com/journal/the-journal-of-the-american-dental-association-1922	Originality
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	<i>oxide-eugenol vs calcium hydroxide/iodoform paste in primary molars: a clinical study. Pediatr Dent. 2008</i>	SpringerLink https://link.springer.com/chapter/10.1007/978-3-319-27553-6_6	
643.	<i>Chawla HS, Setia S, Gupta N, Gauba K, Goyal A. Evaluation of a mixture of zinc oxide, calcium hydroxide, and sodium fluoride as a new root canal filling material for primary teeth.</i>	Evaluation of a mixture of zinc oxide–10% sodium fluoride as novel root ... https://www.jisppd.com/text.asp?2019/37/4/392/270472	Originality
644.	<i>Journal of Indian Society of Pedodontics and Preventive Dentistry.</i>	Evaluation of a mixture of zinc oxide, calcium hydroxide, and sodium ... https://www.jisppd.com/article.asp?issn=0970-4388;year=2008;volume=26;issue=2;spage=53;epage=58;aulast=Chawla	Originality
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646.	<i>Coll JA, Sadrian R. Predicting pulpectomy success and its relationship to exfoliation and succedaneous dentition. Pediatr Dent. 1996</i>	Pulpectomy and Root Canal Treatment (RCT) in Primary ... - SpringerLink https://link.springer.com/chapter/10.1007/978-3-319-27553-6_6	Originality
647.	<i>Markowitz K, Moynihan M, Liu M, Kim S. Biologic properties of eugenol and zinc oxide-eugenol.</i>	Evaluation of a mixture of zinc oxide–10% sodium fluoride as novel root ... https://www.jisppd.com/text.asp?2019/37/4/392/270472	Originality



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